

Machine and Tool

BLUE BOOK

A HITCHCOCK PUBLICATION

DECEMBER • 1960



CREED FOR TODAY:

Prove all things;
hold fast that which is good

See Christmas Editorial • Page 79



He's Watching a Band Sawing Miracle

This band saw operator at the Bell & Gossett Company plant in Morton Grove, Illinois, is watching "Controlled Accuracy" . . . accuracy being held to within a few thousands of being perfectly straight, and he can actually see the band blade being guided in the saw cut to produce this accuracy! No further machining is required before the pipe is welded into an assembly for a Bell & Gossett Heat Exchanger Unit.

Band sawing accuracy like this is nothing short of miraculous—especially when it can be done on a high production basis, as Bell & Gossett is doing. And when the same tolerances can be held on cut-off pieces from 2" to 18" in diameter, this MARVEL #81 Band Saw Machine can be truly called a precision machine tool.

The secret of this amazing sawing accuracy is in the MARVEL "SURE-LINE" Automatic Accuracy Control—a simple and extremely effective

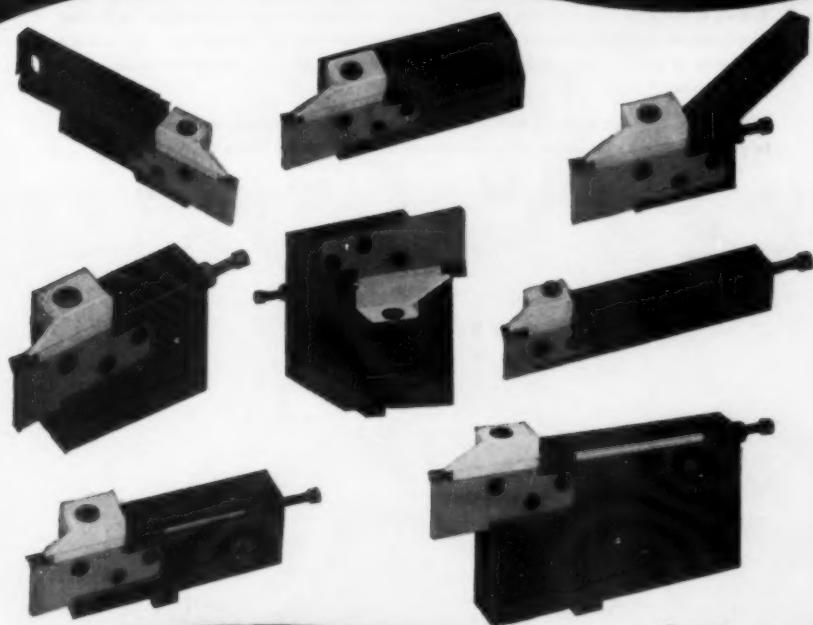
electro-mechanical servo-mechanism that continuously senses and automatically corrects any tendency of a band blade to drift to either side of a desired line of cut. The "SURE-LINE" unit literally "steers" the blade to make a straight cut. This permits the use of heavier feed pressures and, when desirable, higher blade speeds, to do the work faster, without sacrifice of accuracy. Incorporated in the new MARVEL #81 Series High Speed Heavy Duty Hydraulic Band Saws, the "SURE-LINE" permits full utilization of all the advantages of high speed steel band saw blades—while extending their usable blade life as much as 50%.

Before you buy any band saw machine, get complete details on MARVEL #81 Series Single Cut, or Automatic Shuttle Type Bar Feed Production Band Saws—the machines **DESIGNED AND BUILT TO REDUCE SAWING COSTS**. Write for catalog today.

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December, 1960

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- Electric clutch variable speed drive
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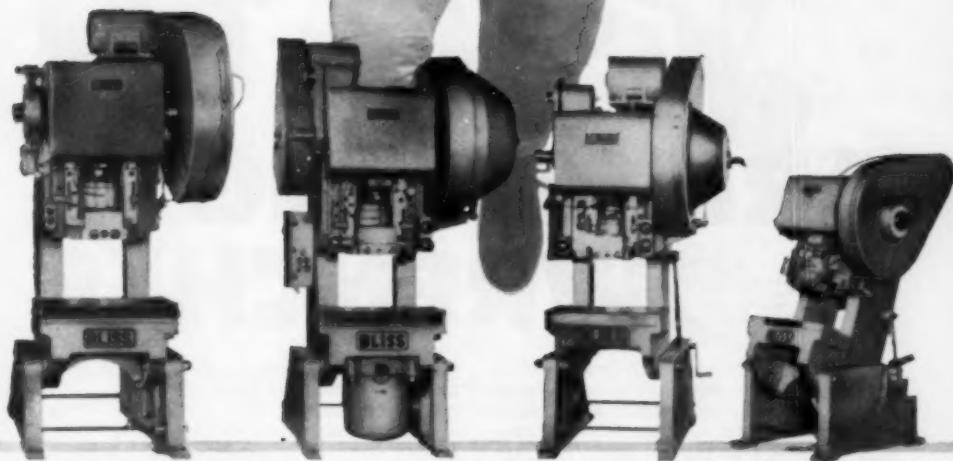
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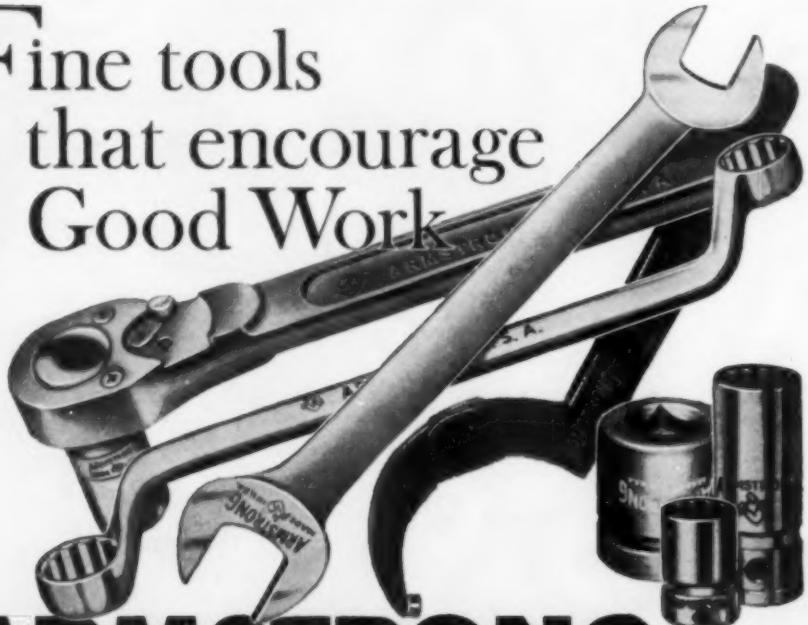
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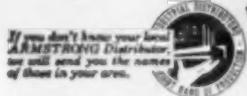
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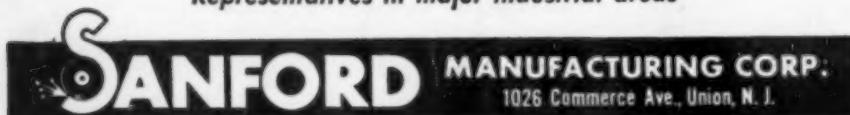
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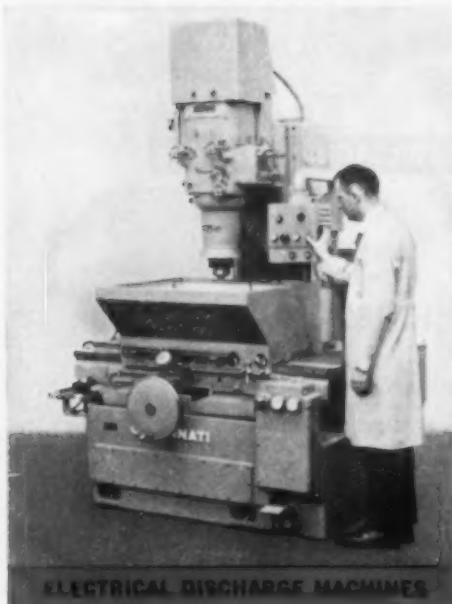


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of electrical machining equipment...

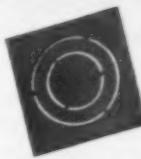
There are three general classifications of electrical machining, each having particular advantages that solve production problems across the complete field of metalworking. Cincinnati Milling builds equipment for all three, and is prepared to show you the potential for widening design horizons and reducing costs in your shop.

Which Electrical Machining Process is best for you?

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CUTTER AND TOOL GRINDERS • ELECTRICAL MACHINING EQUIPMENT



For vertical feed, through-hole production applications in hard-to-machine metals, ECM leaves a burr-free surface with no thermal change, opens new areas of cost reduction. Part at left is tough steel, in which narrow circumferential slots were machined by the electro-chemical process.

CINCINNATI
MILLING MACHINE DIVISION

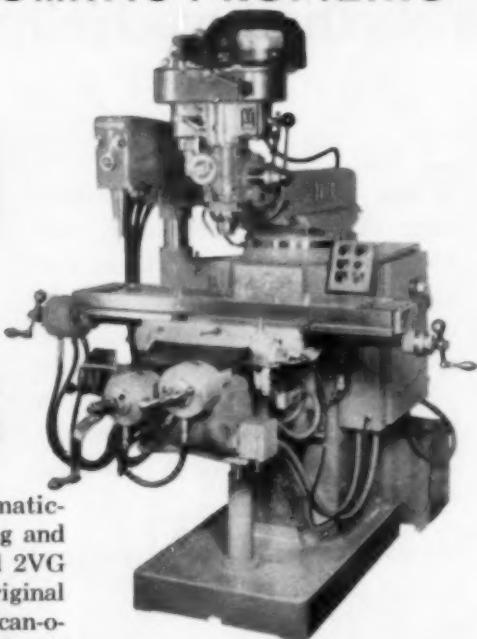
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December, 1960

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3-DIMENSIONAL DUPLICATING
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TREE SCAN -O- MATIC

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- Fully automatic
- Scans in either direction
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A CASE-HISTORY REPORT

Production Time and Cost Reduced 80% Product Quality Improved with **HARTFORD SPECIAL** Air Hydraulic DRILL UNITS



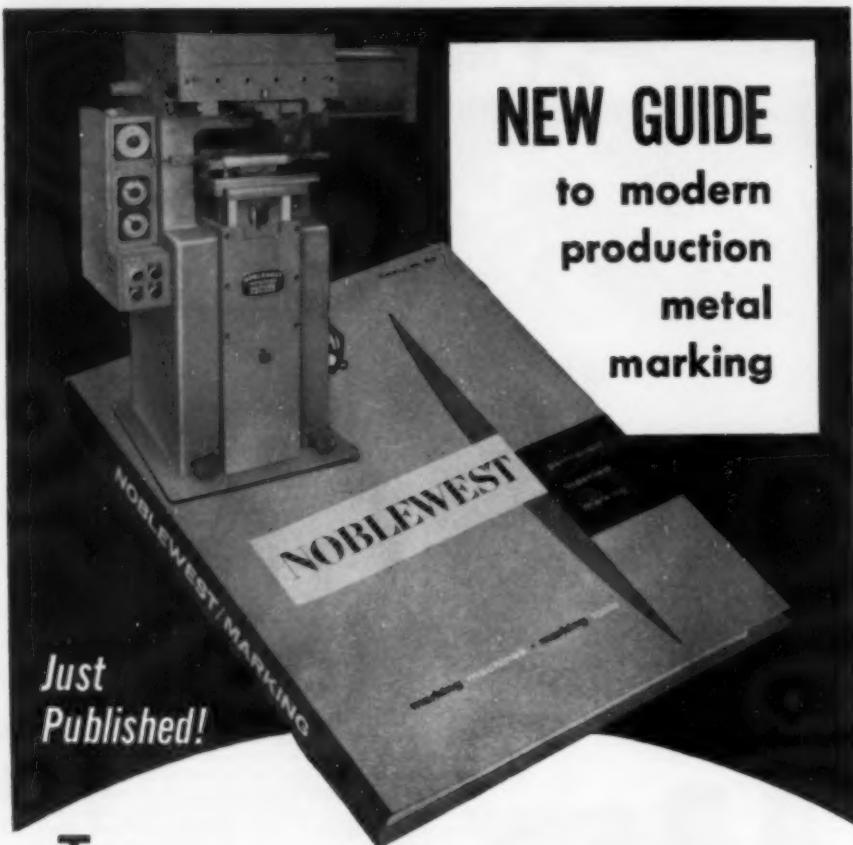
PART:
Hydraulic
Control Sleeve
MATERIAL:
8017 Steel
REQUIRED:
78 Accurately
Located Holes.
Drilled at
60° Angle.

The Char-Lynn Company, of Minneapolis, Minnesota, is a well-known manufacturer of hydraulic equipment for farm machinery. Rapidly increasing demands for the Char-Lynn Power Steering Unit made it necessary for this company to increase its production rates for components like the control sleeve shown here. To accomplish this, Char-Lynn switched from single spindle machines to two- and six-spindle machines assembled from Model 19-150 Air Hydraulic Drill Units and other standard components produced by The Hartford Special Machinery Company. As a result of this change-over, drilling time for the 78 holes required has been cut from 42-84 minutes to 9-10 minutes . . . and per-piece costs have been cut from \$5.65 to \$1.80! Smooth operation with "no-surge" break-through has eliminated burring, so scraping is no longer necessary. Maintenance is only about one sixth of that previously required, and there have been no breakdowns that weren't "man-made." Write today for complete information, outlining your parts production requirements.

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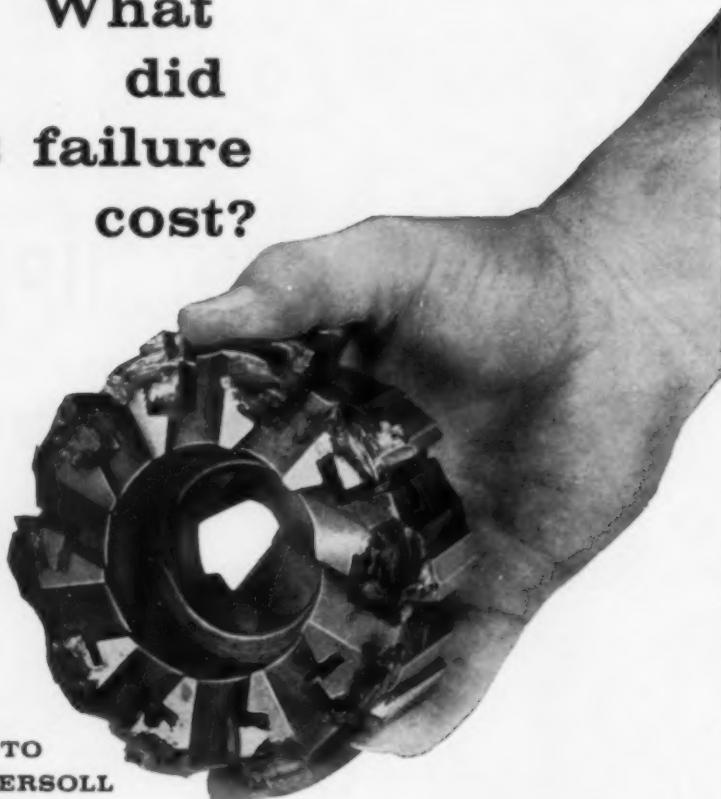
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FOR THE
ANSWER



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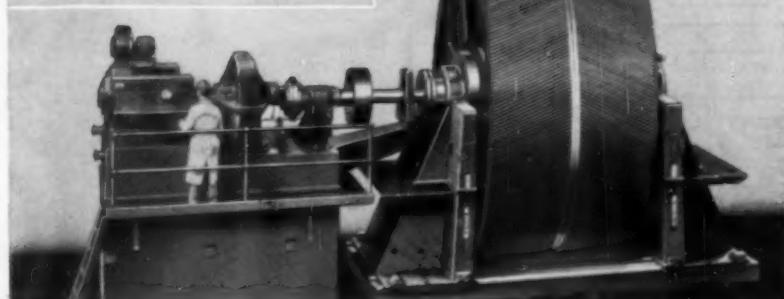
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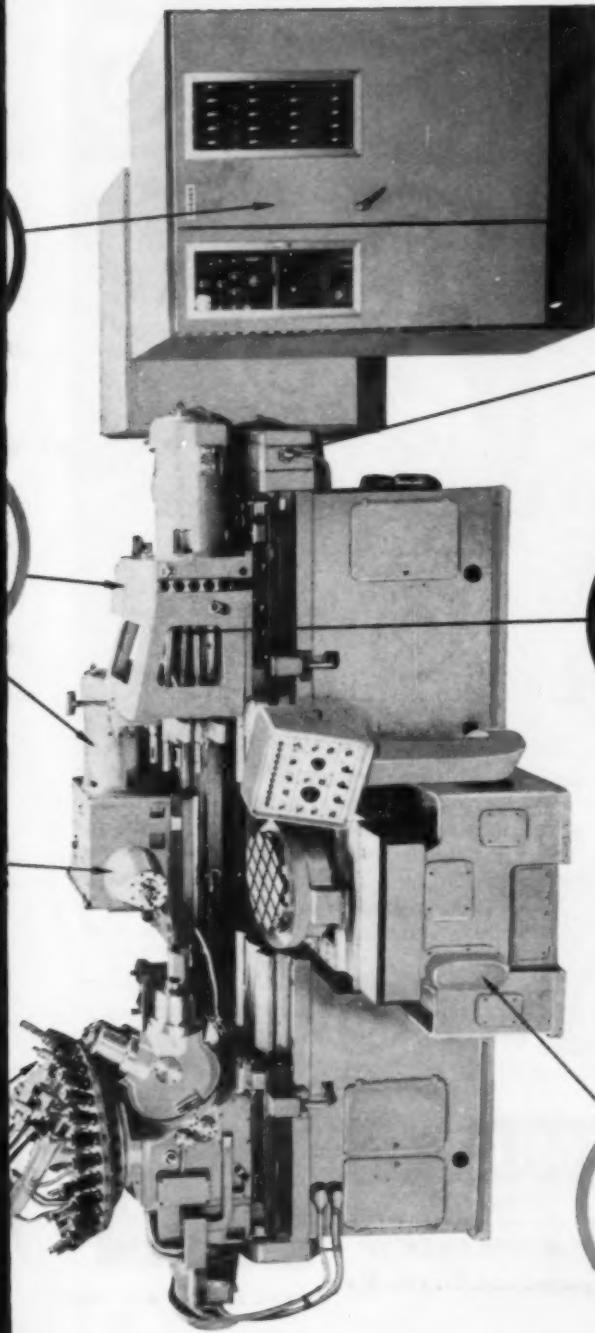
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Building Block
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capability you require.
The Multiple Spindle
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Head are options.

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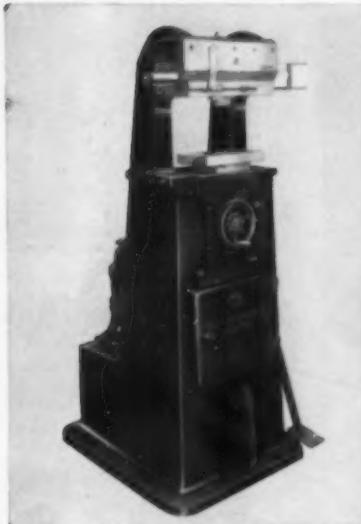


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rate override
controls.

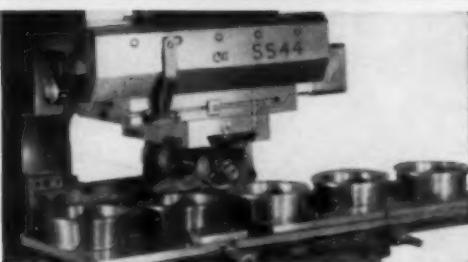
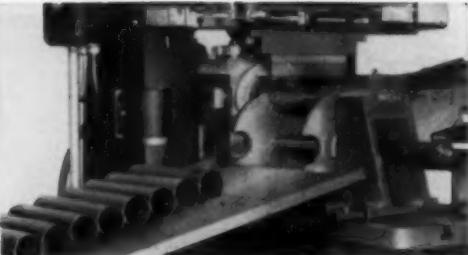
Multiple Spindle
Head (shown) or
Precision Boring
Head optional.

All axes
equipped with
Hughes patented
Position Transducers.
This means no
deterioration of
accuracy or
sensitivity.

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Always Use Blanchard Wheels!

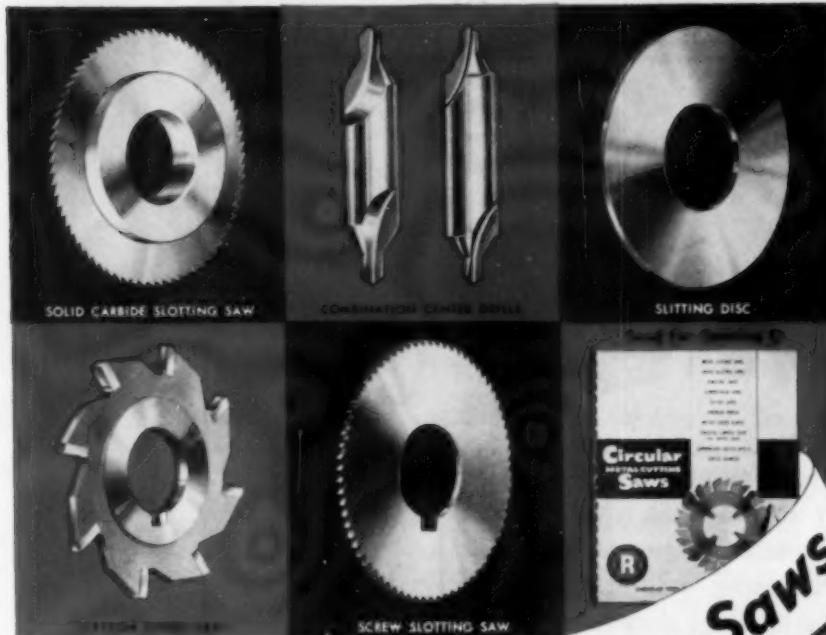
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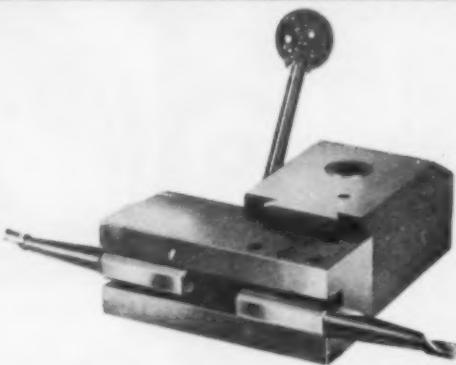
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21

VERSATILE LIDO BORING TOOLS*



LIDO boring tools can be simply and effectively mounted in tool holders for lathe use (above) or clamped equally as simply in offset boring heads (right) due to the parallel flat design of shank. Round shank with parallel flats makes positive three-point contact and permits new rigidity in tool clamping. Set-up and grinding time is drastically reduced. LIDO tools are re-sharpened as easily as grinding a single point lathe tool. Available in tool room sets — carbide or HSS — in bore sizes ranging from $\frac{1}{8}$ " to $1\frac{1}{4}$ " (Stubby or standard bore length) in five shank sizes. Prices and complete data provided promptly on request!

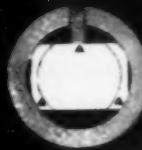


LIDO'S
THREE POINT
CLAMPING *
(below, right)

PAT. APPLIED FOR

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MANUFACTURED BY
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FOR MORE INFORMATION about this and other major chuck developments, contact your Skinner Representative listed in the Yellow Pages or write us at Dept. 14-D.



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December, 1960

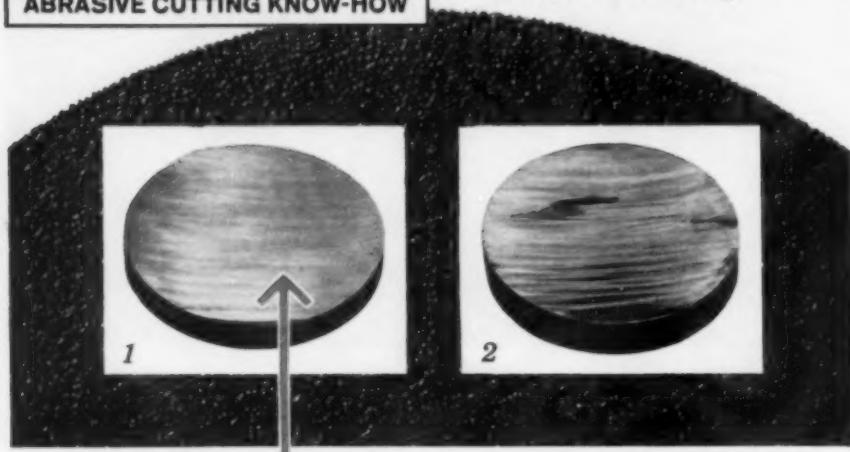
23

SKINNER CHUCKS

Allison-Campbell

ABRASIVE CUTTING KNOW-HOW

Close-up view of resinoid wheel shows rough texture that provides cooler, cleaner cutting



This CLEAN cut was made with a ROUGH-SIDED wheel!

1. THE SPECIMEN ON THE LEFT ABOVE was cut from a $3\frac{1}{4}$ " diameter hardened steel bar in just 28 seconds with an ALLISON rough-sided dry abrasive cutting wheel like the one shown in the background. Note that the cut is clean and practically burn-free.

2. The specimen on the right was cut under the same conditions and with a wheel of the same formulation, but without rough sides. The result — the cut took 30 seconds and produced a badly burned surface.

3. The secret is the extra clearance the rough sides give *inside* the cut. This results in *cooler* cutting action and added wheel life. That's why, for the dry abrasive cutting of solid bars, heavy-wall tubing and structural shapes, we generally recommend rough-sided wheels. Your problem might be different. An ALLISON-CAMPBELL Field Engineer can recommend the right wheel for *every* cut-off job.



3 Inside the cut,
rough sides give
extra clearance

Write for Bulletin DH-214A for details on the complete line of ALLISON wheels



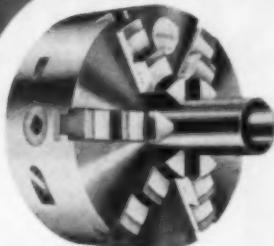
ALLISON ABRASIVE CUTTING WHEELS

Allison-Campbell Division • American Chain & Cable Company, Inc.

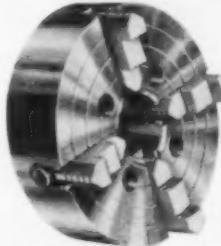
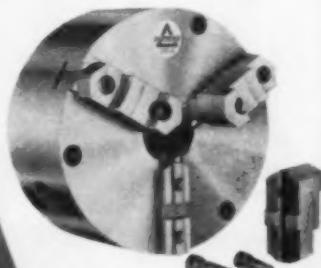
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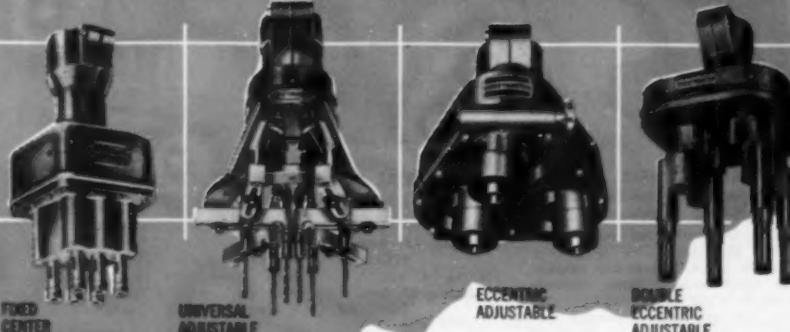
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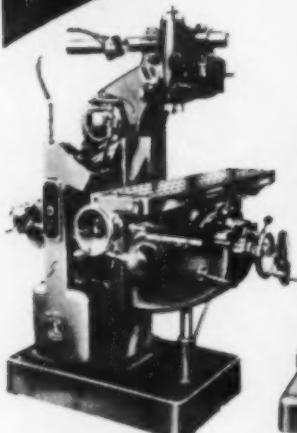
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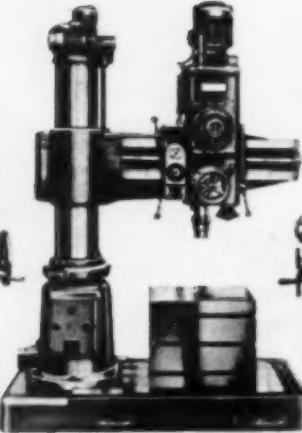
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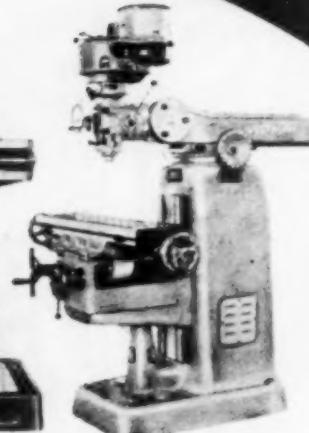
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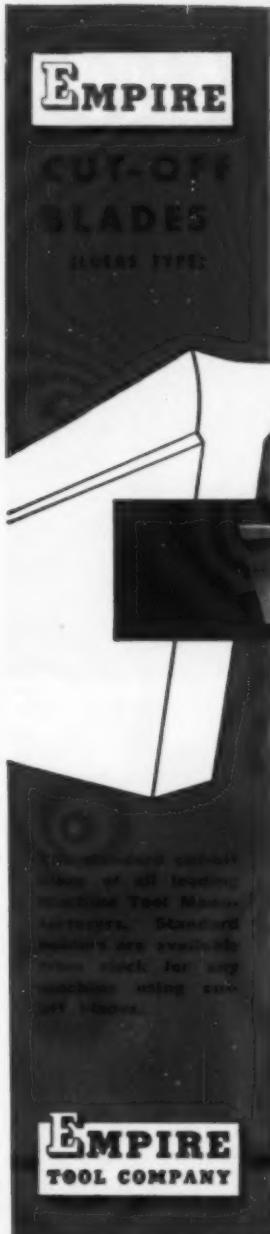
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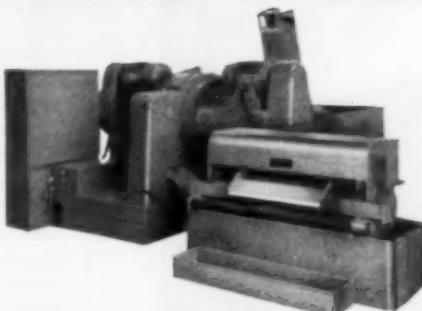
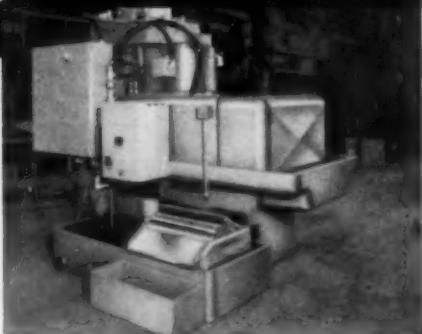
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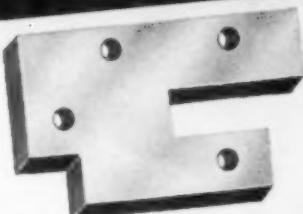
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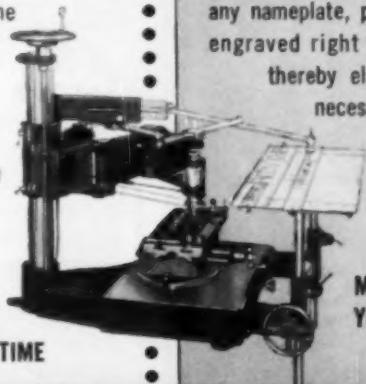
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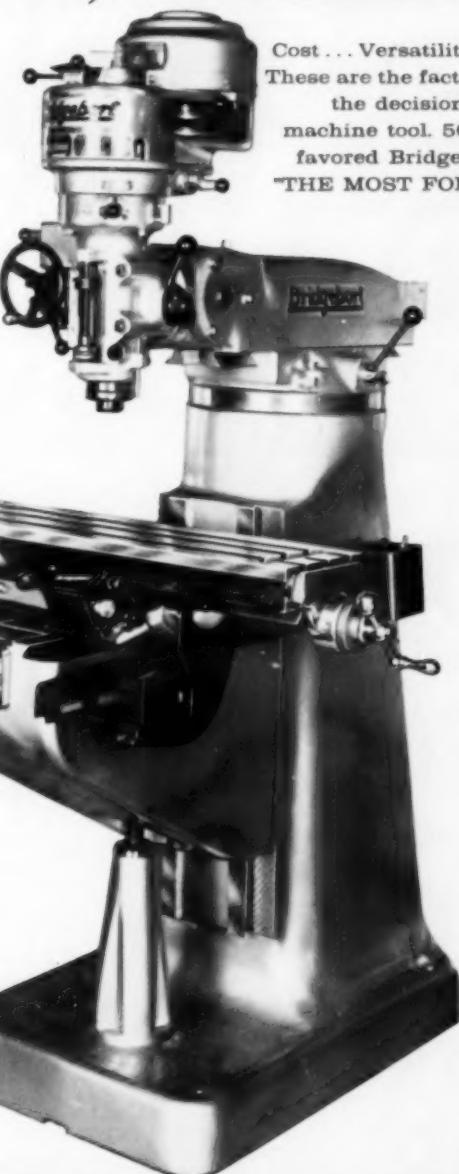
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Our "Anniversary" is measured in production -- not time. This 50,000th Bridgeport Turret Milling Machine, completed on July 6, 1960, was finished in gold to commemorate the occasion.

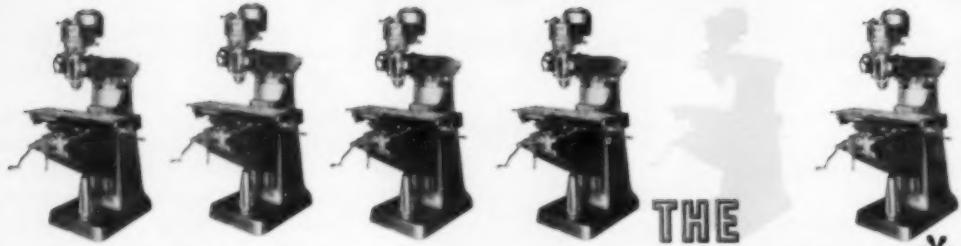


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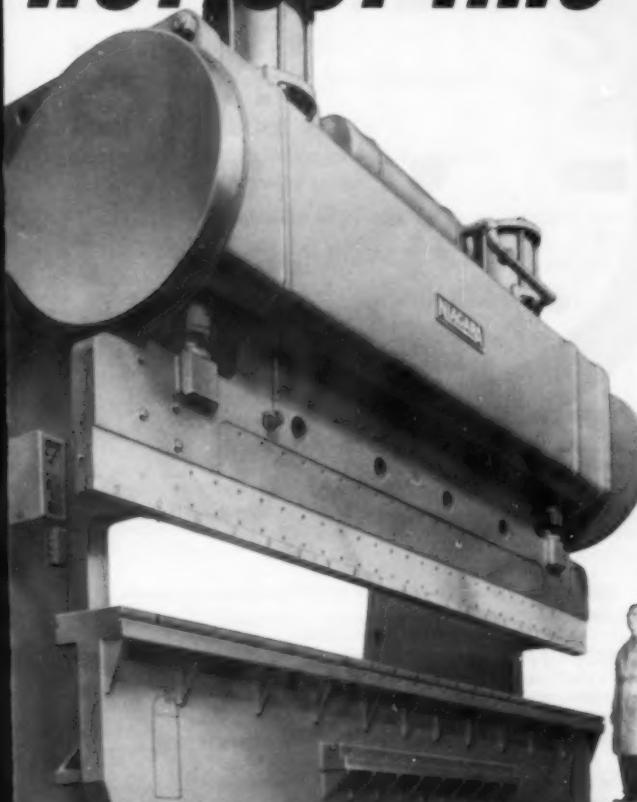
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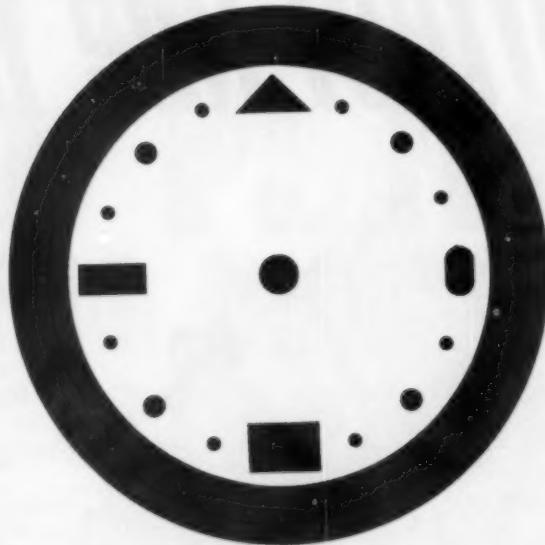
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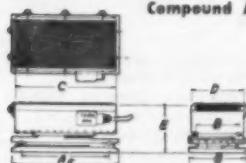


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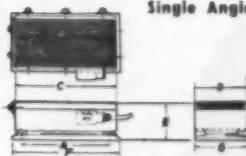
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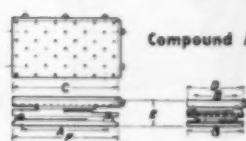
Compound Angle Sine Chuck

MODEL	(SINE) A	(SINE) B	C	D	E	F	G	PRICE
ELECTRO-MAGNETIC								
DA-5	5,000	5,000	6½	6	3½	7½	6½	\$ 495.00
DA-10	10,000	5,000	11½	6	3½	12½	6½	650.00
DA-1010	10,000	10,000	11½	10	3½	12½	10½	1,300.00
DA-20	20,000	5,000	21½	6	3½	22½	6½	1,750.00
PERMANENT MAGNET								
DP-5	5,000	5,000	6	6	3½	7½	6½	495.00
DP-10	10,000	5,000	12	6	3½	12½	6½	650.00



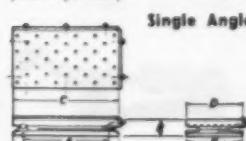
Single Angle Sine Chuck

MODEL	(SINE) A	C	D	E	F	G	PRICE
ELECTRO-MAGNETIC							
SA-5	5,000	6½	6	4½	7½	6½	\$ 340.00
SA-10	10,000	11½	6	4½	12½	6½	430.00
SA-1010	10,000	11½	10	4½	12½	10½	830.00
SA-20	20,000	21½	6	4½	22½	6½	1,250.00
PERMANENT MAGNET							
SP-5	5,000	6	6	3½	7½	6½	340.00
SP-10	10,000	12	6	3½	12½	6½	430.00



Compound Angle Sine Plate

MODEL	(SINE) A	C	D	E	F	G	PRICE	
DA-5P	5,000	5,000	6½	6½	3½	7½	6½	\$ 430.00
DA-10P	10,000	5,000	11½	6½	3½	12½	6½	595.00
DA-1010P	10,000	10,000	11½	11	3½	12½	11	1,050.00
DA-20P	20,000	5,000	21½	6½	3½	22½	10½	1,350.00



Single Angle Sine Plate

MODEL	(SINE) A	C	D	E	F	G	PRICE
SA-5P	5,000	6½	6½	2½	7½	6½	\$ 380.00
SA-10P	10,000	11½	6½	2½	7½	6½	380.00
SA-1010P	10,000	11½	11	2½	12½	11	750.00
SA-20P	20,000	21½	6½	2½	22½	6½	920.00

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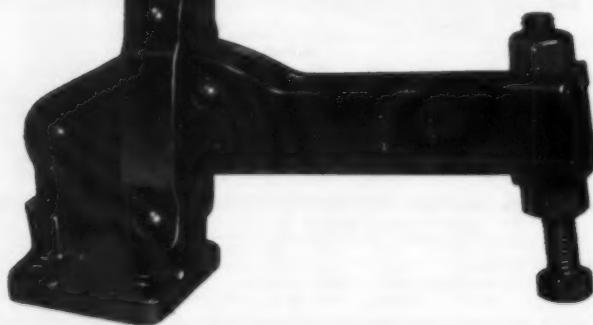
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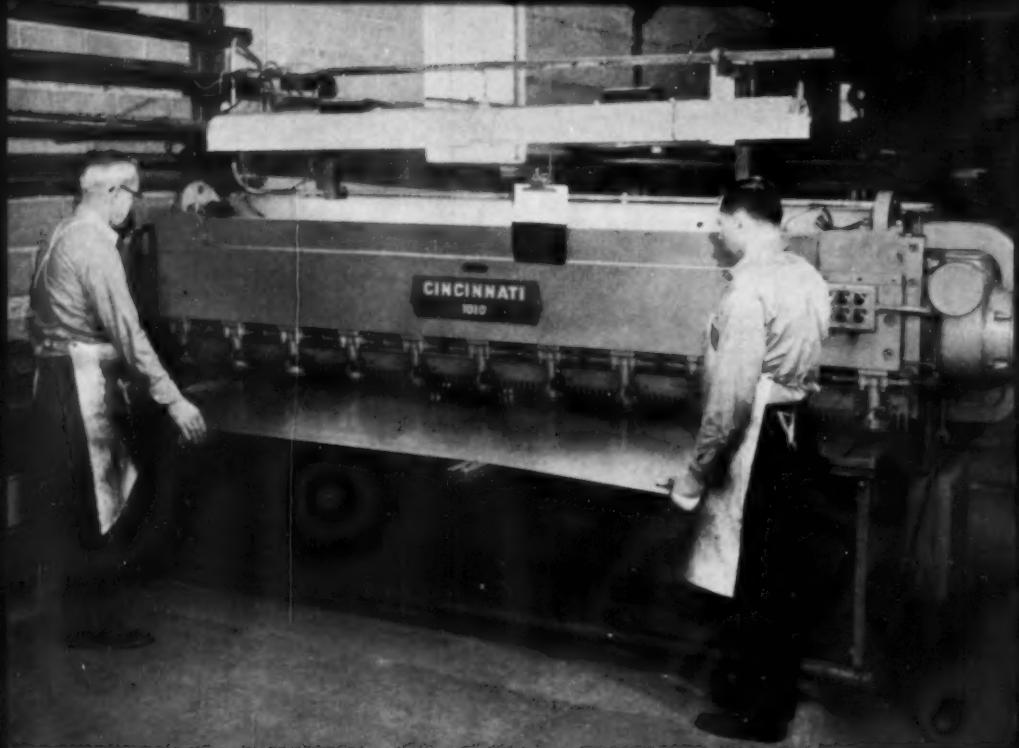


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LATROBE, PENNSYLVANIA

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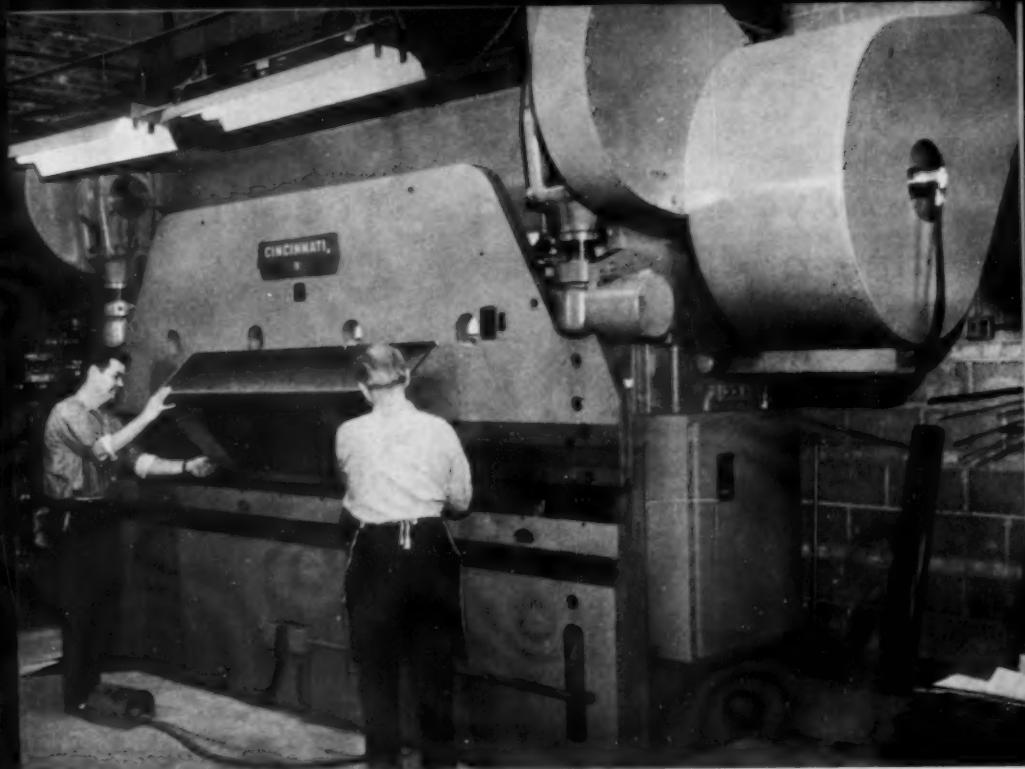


CINCINNATI® PRESS BRAKE AND SHEAR

"cut our

"The Cincinnati equipment in our shop is the best in our operation," according to Sal Rochi of G. & M. Metal Fabricators, Franklin Park, Ill. Their Cincinnati Press Brake and Shear help make a wide variety

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Courtesy G. & M. Metal Fabricators, Inc.

operating time"

of sheet metal products (radio chassis, boxes, cabinets, lighting fixtures, etc.).

"Our Cincinnati Press Brake with Automatic Cycle has cut our operating time in forming and perforating," says Rochi. (Auto-

matic Cycle eliminates the need for clutch-slipping and jogging the ram.) "The Cincinnati Shear gives us sure accuracy for all our parts, from brackets to cabinets."

See our insert in Sweet's Machine Tool File.



THE CINCINNATI SHAPER CO.

Shapers / Shears / Press Brakes Cincinnati 11, Ohio, U. S. A.

In Scotland: The Cincinnati Shaper Co., Ltd., Glasgow

now you can check & record
fine-pitch gear accuracy



at 1600 magnifications

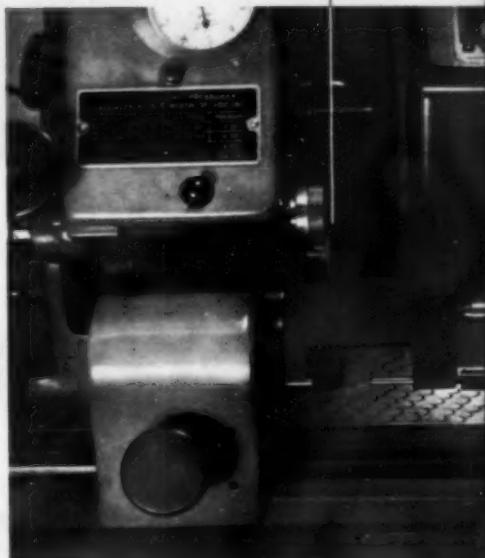
on the No. 4 Fellows Red Liner

Now, the No. 4 Red Liner makes "composite" checks on the finest instrument gears with unbelievable accuracy and sensitivity. 1600 to 1 magnifications are obtained with the electrical recording system which gives a written, unbiased record for instant reading or for proof-of-accuracy files.

One report states — "11 teeth, 200 D. P. pinion backed up to a 100 tooth gear on a cluster, checked easily on the No. 4 Red Liner."

The job shown is 96 pitch with 22 teeth on the small gear and 80 teeth on the larger gear. The pinion shaft rides in vee's in a turret-type fixture.

Fellows inspection units cover a range from the tiniest instrument gear up to some that are 24 inches in diameter.



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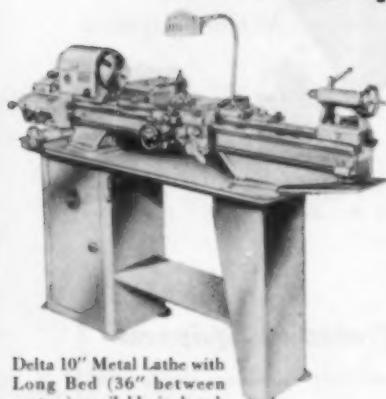
December, 1960



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DELTA

NEW 'Long Bed' 10" Metal Lathe offers capacity up to 36"



Delta 10" Metal Lathe with
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See your Delta Industrial Distributor (listed under "TOOLS" or "MACHINERY" in the Yellow Pages) or write for FREE catalog: Rockwell Manufacturing Co., Delta Power Tool Division, 610 M N. Lexington Ave., Pittsburgh 8, Pa. In Canada: Rockwell Manufacturing Co. of Canada, Ltd., Box 420, Guelph, Ont.

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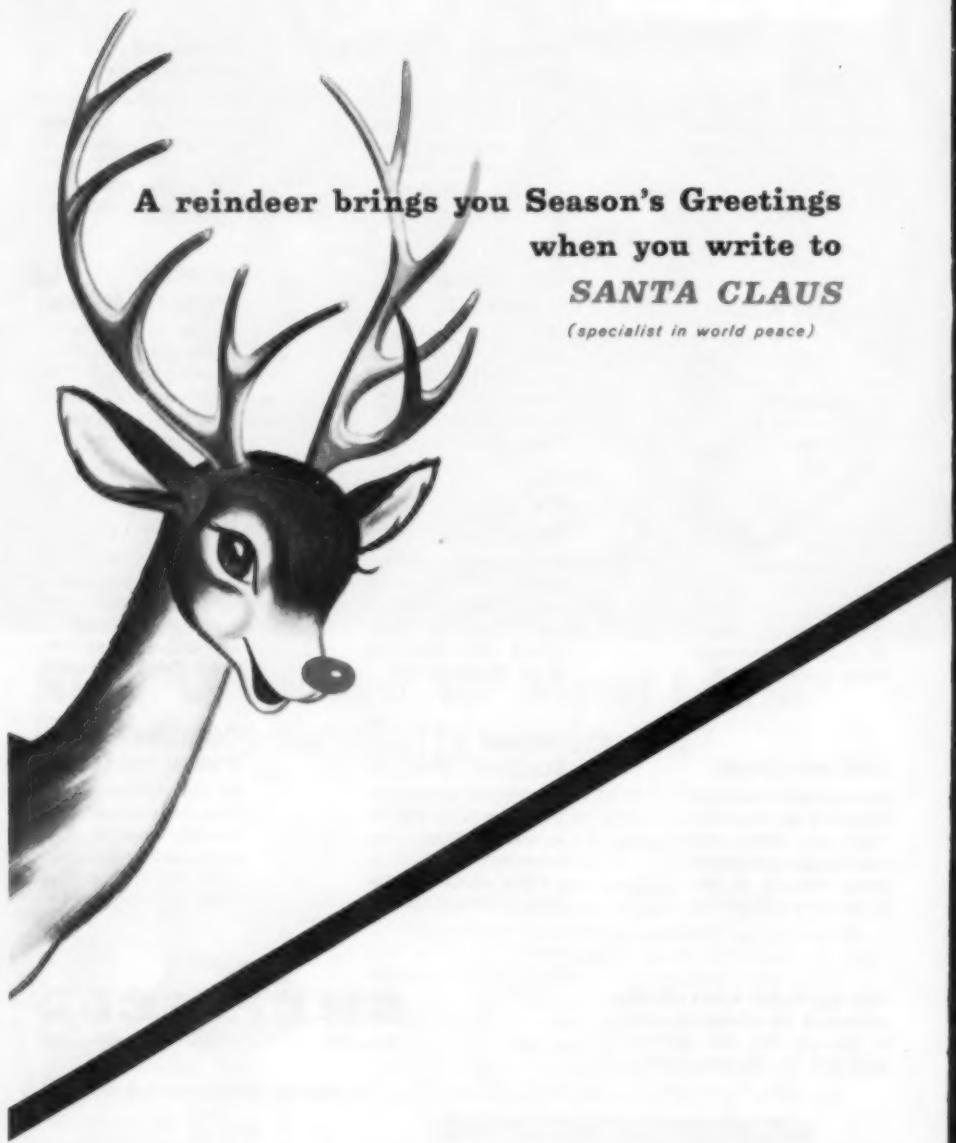
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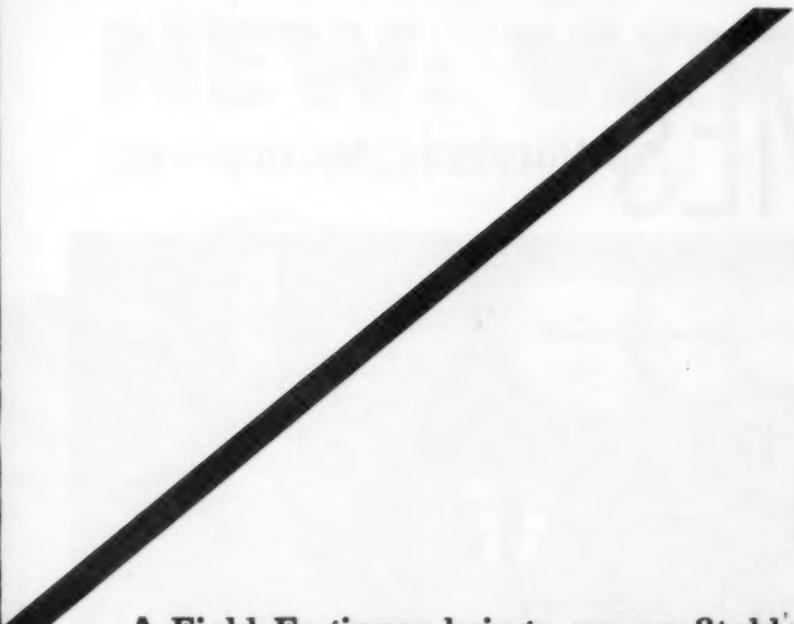
December, 1960

43



A reindeer brings you Season's Greetings
when you write to
SANTA CLAUS

(specialist in world peace)



A Field Engineer brings you profitable ideas when you write to LINCOLN

(specialists in arc welding)

WRITING to Santa Claus is an exciting experience for the whole family. Eager faces . . . pencilled lists . . . crackling fire . . . and the air alive with expectancy. And then the long, almost unending wait until Christmas, when miraculously St. Nick generally delivers even a little more than was desired. This is why we have faith in him. That's the spirit of Christmas!

Now, we don't say our Field Engineers will arrive in sleighs filled with toys, but this we can guarantee: if you write a letter to LINCOLN, the Field Engineer who calls will be able to give you a good deal more help than you expected. Not only does he know welding products but also the best procedure to use on each job. He understands how to relate welding profitably to your total manufacturing operation.

That's why so many companies who have had faith in LINCOLN for over fifty years say, "It's a good idea to do business with LINCOLN where arc welding is a specialty and cost reduction comes to you as a 'plus' at no charge."

Merry Christmas!

THE LINCOLN ELECTRIC COMPANY

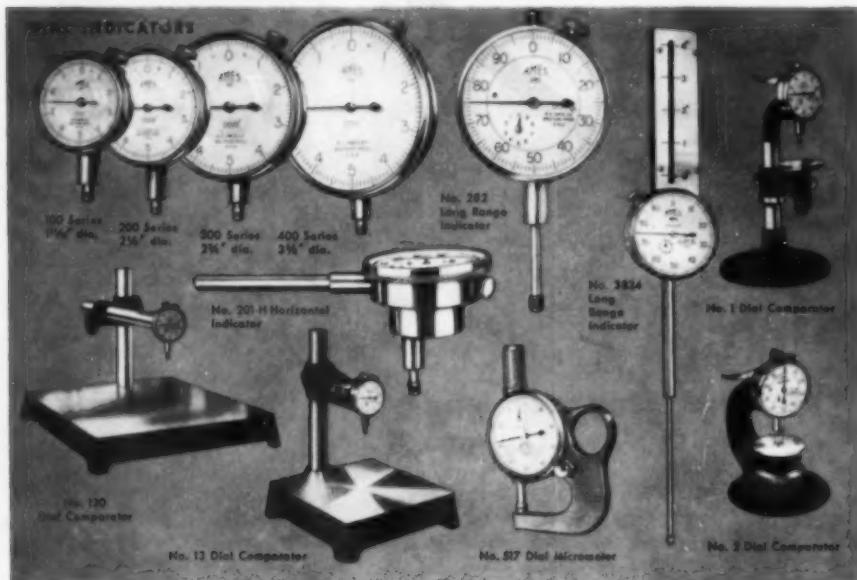
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MACHINE and TOOL BLUE BOOK

NEW: W-T

ALKER-TURNER

20" 'POWER FEED' DRILL PRESSES



combine up-front control
with one-hand operation

Every model in this new W-T "Light-Heavyweight" line (and there are 16 of them to fit your needs) offers a revolutionary new mechanical power feed with performance features NEVER BEFORE AVAILABLE on a standard drill press. Now you can do continuous, heavy duty production drilling faster, easier and with greater accuracy.



For unequalled flexibility—front mounted pilot wheel is mechanically integrated with clutch control to provide easy one-hand engagement of power feed; drill point pressure is infinitely adjustable from 0 to maximum capacity of machine; furnishes power and thrust for drilling 1" diameter holes, yet adjusts for use with $\frac{1}{8}$ " bits.

For unmatched versatility—built-in control permits remote operation and can be electrically, hydraulically or mechanically interlocked with other units or synchronized with automation devices. Operator can utilize four feed ratios, drill manually, mechanically or in combination.

See your Walker-Turner Distributor (under "TOOLS" or "MACHINE TOOLS" in the Yellow Pages) for a demonstration. The only way to really appreciate the many outstanding features of these new W-T 20" 'Power Feed' Drill Presses is to see them in action. For FREE brochure giving specifications and information on how to adapt your present W-T 20" drill presses to 'Power Feed', write: Rockwell Manufacturing Company, Walker-Turner Division, Dept. WM23, 400 N. Lexington Ave., Pittsburgh 8, Pa. In Canada: Rockwell Manufacturing Company of Canada, Ltd., Guelph, Ontario.



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Punches might look alike—but quality can't always be seen. Take Richard Brothers advanced heat-treating process, for example. Our electric salt-bath furnace is tailored specifically to the treating of punches and die buttons, which allows us to maintain more rigid specifications. Result? Our punches are tougher, have a higher resistance to impact, will wear longer, and perform more consistently. You can promise your customers the highest quality work . . . delivered on time. Next time, be sure to specify Richard Brothers punches, dies and related tools for all your metal-piercing needs. It pays to do business with the leader.



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WILLIAMS WRENCHES measure longer than Industry Average for extra leverage.
Both ends permit nut rotation in 20°.

Uniform head thickness carefully proportioned for optimum fit on hex and square nuts and bolt heads of regular, heavy or finished series, plus all other series nuts and bolts.

Modified, rectangular handle design offers maximum strength and comfort.

Satin finish for safe, firm grip. No dirt catching or uncomfortable ornamentation.

Height of box wall correctly proportioned for all nut sizes and series.

Depth of jaw opening designed for full bearing on all nut sizes and series.

Slim, narrow jaws combine maximum strength with greatest clearance.

Box head with 12 point opening, offset 15° from handle for obstruction clearance.



Wall thickness designed for maximum strength with greatest clearance.

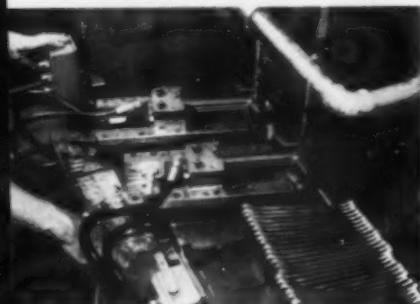
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This three station transfer machine drills, broaches and chamfers box openings to close Williams' tolerances.



Open-end heads are broached to extremely close tolerances on this two station vertical ram machine.

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Unique new use of special

PROBLEM: Cutting slots in arc quenchers. Job was being done by milling cutters which were rapidly blunted or broken by the extremely hard and abrasive arc quencher material. G. E. Department Manager F. W. Rueblinger demanded that cost of cutter maintenance and down-time be reduced.

SOLUTION: Abrasive manufacturers were called in but only Bay State distributor Vince Flynn was willing to really work on this unique problem. He brought key G. E. Production men together with Bay State's Research Staff.

RESULT: After much development work, Bay State engineered special diamond wheels that cut fast and maintained extremely fine tolerances. The wheels cut

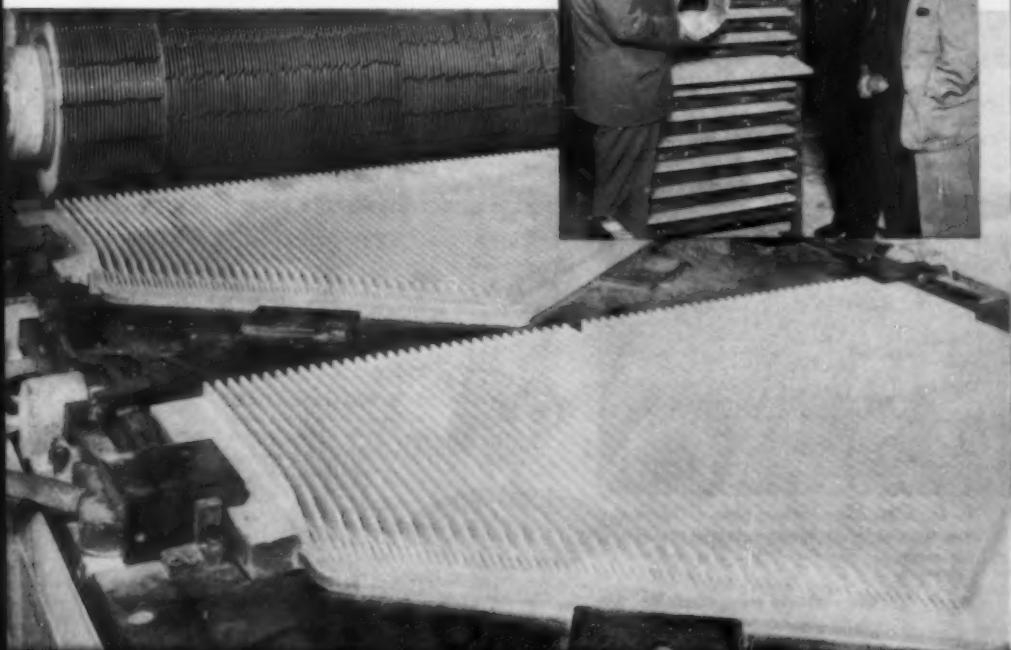
easily, too, because no added driving power was needed in spite of the fact that as many as 136 wheels made simultaneous cuts $\frac{1}{4}$ " deep... and feed rate was actually increased nearly 400%! Overall productivity went up a good 50%! Wheel life is conservatively estimated at 3 years so the cutter maintenance problem has been completely licked.

Bay State is now intensively researching grinding wheel applications for G. E.'s man-made diamonds.

Whether you have unusually complex grinding problems or simply want to cut costs, your Bay State distributor and direct representative are both hard-working, thoroughly trained and widely experienced. *Better grinding at lower cost... that is their business.*

Right: Discussing the increased productivity that resulted from grinding, instead of cutting, hard asbestos-composition arc-quenchers, are, left to right, Vincent J. Flynn, Bay State Distributor; F. W. Rueblinger, Manager-Manufacturing, John Stabb, Supervisor-Advanced Manufacturing-Engineering, and William A. Siter, Manager-Manufacturing-Engineering.

Below: Two arc-quenchers are shown immediately after passing under a tremendous array of 136 Bay State diamond wheels which have made simultaneous cuts $\frac{1}{4}$ " deep.



diamond wheels ups productivity 50%

Vincent J. Flynn was a Tool & Die Maker at the Frankford Arsenal when World War II came along and he joined the U.S.A.F. With this solid background in practical shopwork, he went into industrial distribution after the war, opening up his own business 5 years ago. Now a highly successful Bay State Distributor, he has this to say about Bay State: "They not only give me and my customers first-class service on routine problems . . . they also roll up their sleeves and dig in every time I come up with a puzzler . . . like this one, for example."



BAY STATE ABRASIVES



● Bay State Abrasive Products Co., Westboro, Massachusetts.
In Canada: Bay State Abrasive Products Co., (Canada) Ltd., Brantford, Ontario.
Branch Offices: Chicago, Cleveland, Detroit, Los Angeles, Pittsburgh. Distributors: All principal cities.

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EXTRA RIGIDITY of Chicago-Latrobe Drill pays off at Tool Show demonstration!



3" hole through 3" plate took just 52 seconds. Note perfectly formed chips that indicate continuous, vibration-free cutting even while operating at .100" rate of feed. Demonstration took place at Machine Tool Show.

3" DIA. HOLE DRILLED
THRU 3" OF STEEL IN
JUST 52 SECONDS!



A Chicago-Latrobe Service Engineer checks drill performance with Carlton operator. This C-L service is available to all drill users. Ask your C-L Distributor.

At the Chicago Tool Show the Carlton Machine Tool Company introduced its new 6 ft. Radial Drilling Machine. In one of the most dramatic drilling operations ever performed, they drilled a 3" diameter hole in a hot rolled steel plate 3" thick in just 52 seconds, operating at 45 RPM with a feed of .100" per revolution.

Chicago-Latrobe was asked to

produce a drill for this demonstration. C-L engineers recommended the regular Type 110 High Speed Taper Shank Drill—*special in length only*.

Unbelievable strength is required for a twist drill to do a job like this, and C-L's exclusive method of producing large diameter drills made the Carlton demonstration possible. Chicago-Latrobe drills are man-

ufactured from grooved stock—rolled to exact specifications; twisted to the correct helix; with the flutes and lands precision milled. This method gets the most from the steel—added torsional strength, maximum rigidity, minimum disturbance to its molecular structure. Specify Chicago-Latrobe for your tough jobs. Chicago-Latrobe products are sold by industrial distributors.

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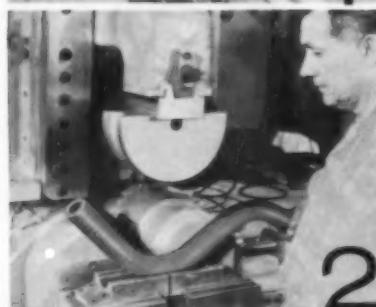
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MACHINE and TOOL BLUE BOOK



1



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3



4

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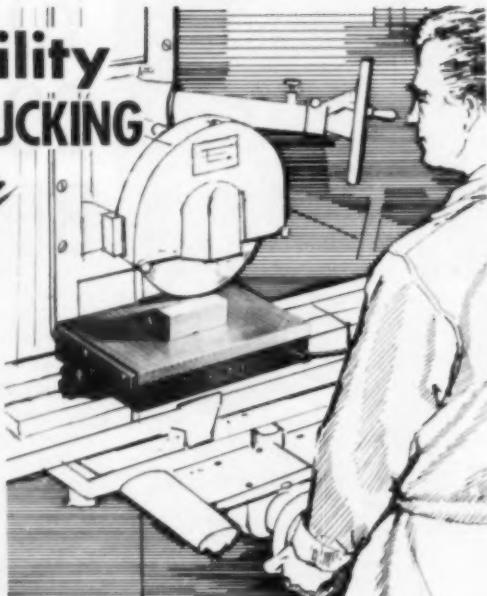
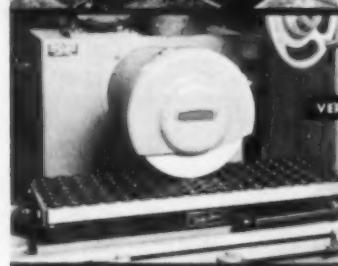
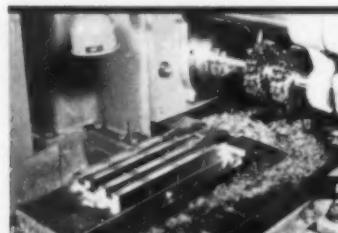
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MACHINE and TOOL BLUE BOOK

ELMES HYDROLAIR...

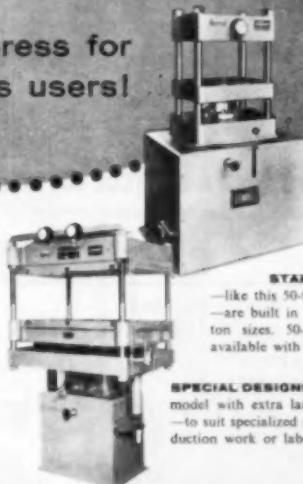
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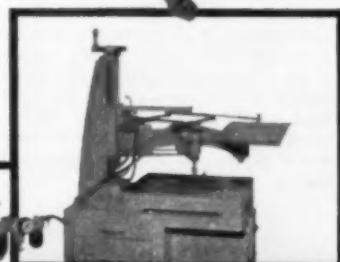
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Now...Type S-3 surface with 150 fpm table

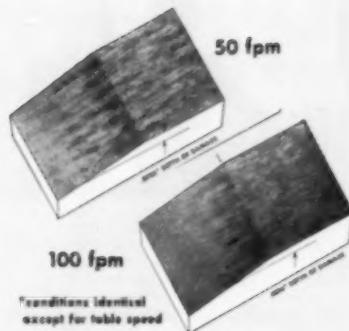
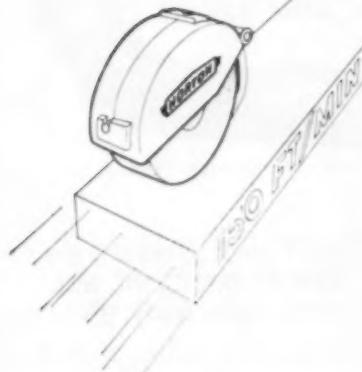
*for faster production than
ever before!*

Available in 6" x 18" and 8" x 24" sizes. Both sizes are equally fast, cool, accurate on long production runs or a wide variety of toolroom grinding. Taller workpieces are easily handled by the 15" vertical capacity of the 6" S-3, and 13 $\frac{1}{4}$ " capacity of the 8" S-3 Grinder. Other job-proved features include a two-speed .0001" increment hand wheel, assuring accurate vertical speed and fast positioning . . . contoured splash guards, for better sighting and loading.



NORTON PRODUCTS: Abrasives • Grinding Wheels • Mason Tools • Refractories • Electro Chemicals — DEERFIELD DIVISION: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes

grinders speed...



*Conditions identical
except for table speed

You Get Better Quality Work with Norton Type S-3 surface grinders, thanks to their faster table speeds, which reduce heat damage. The above test samples show how faster table speeds result in cooler grinding.

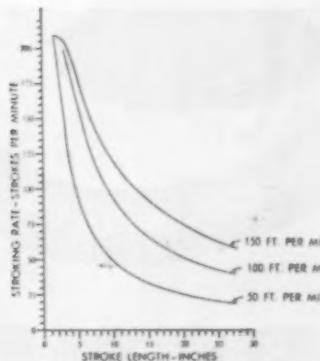
Long popular for their pace-setting table speeds up to 125 feet per minute, Norton Type S-3 surface grinders have given complete proof of their ability to finish workpieces smoother, faster, at lower cost.

Now S-3 grinders are also available with table speed stepped up to a new high of 150 feet per minute — enabling you to finish flat faster than ever, with cool-running action that saves time and money on every job.

Get the whole story from your Norton Man, a trained specialist who can help you get better grinds at lower cost. Or ask for Catalogs 1982 and 2128. NORTON COMPANY, Machine Tool Division, Worcester 6, Mass. District Offices: Worcester, Hartford, Cleveland, Chicago, Detroit. In Canada: J. H. Ryder Machinery Co. Ltd., Toronto 5.



75 years of... Making better products
...to make your products better



Calculate Your Savings from this production rate chart. Grinding time is reduced in proportion to the increase in stocking rate. The higher speeds also greatly increase the rate of stock removal.

MACHINE TOOL DIVISION: Grinding and Lapping Machines — B & E DIVISION: Shapers

• Gear Cutting Machines • Gear Induction Hardening

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December, 1960

59

TRICKY BENDS ARE NO TRICK

With Pedrick Production Benders
any bend is an easy bend—fast and
economical, too! Pipe, tubing, bus bar
or structural metal—*bend with Pedrick.*

PEDRICK TOOL AND MACHINE CO.
3640 N. Lawrence St., Phila. 40, Pa., Dept. 3.



ee You'll profit by reading the
NEW PEDRICK LINE BUL-
LETIN. Write today. 99



BEND WITH PEDRICK

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**SEE YOUR LOCAL DUMORE
INDUSTRIAL DISTRIBUTOR**

for **PRECISION
GRINDING**
EXTERNAL and INTERNAL
at lower cost

with **DUMORE[®]** **PORTABLE GRINDERS**

quick easy mounting on lathes, planers, shapers, millers



Converts lathes to cylindrical grinders . . . shapers,
planers, millers to surface grinders . . . standard
grinders to high-speed internal grinders.

Nine models, from 1/14 to 3 hp, swing $\frac{1}{8}$ " to 12"
diameter wheels. Speeds from 4600 to 42,500 RPM.
Priced from \$93.00 up, FOB Racine. Write for details.



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All Purpose
Precision
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MOUNTED ON MILLER . . .
a high speed grinding head
using small mounted wheels,
points or carbide burs.



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finishes I.D. of chuck on pro-
duction.



MOUNTED ON PLANER . . .
a low cost surface grinder.



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SYNTRON cost-reducing equipment of proven dependability



SYNTRON Vertical Vibratory
PARTS FEEDERS

. . . replace manual methods of handling small parts . . . handle parts of almost every size, shape and material at high instantly controlled rates to tapping, counting, inspecting, tooling, centerless grinding, stamping machines, and other operations.

SYNTRON Parts Feeders offer dependable, high count, simple feed feeding of parts. Designed for efficient, dependable service with little or no maintenance.



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Specify this

POPE

SUPER PRECISION, 1 HP, 3600 RPM
MOTORIZED TOOL AND CUTTER GRINDER
CLEARANCE ANGLE SWIVELLING HEAD WITH
ANGULAR ADJUSTMENT IN A VERTICAL PLANE

and get these seven savings:



1. Strong, long lasting tool cutting edges because cup wheel cutter grinding can be used for practically all clearance angles.
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3. A single set-up grinds most cutters and reamers all over, using the swivelling table and Pope tilting head.
4. No more mistakes on clearance angles. They read directly in degrees from the scale provided on the head.
5. No more trouble or time wasted getting the right clearance angle on the tough ones such as slab mills, **taper reamers**, angular cutters and form tools.
6. No more heat checking of cutters. One safe speed — 3600 RPM — for all wheels generally used on cutter grinders.
7. Quick, easy adjustment saves you time and money every time you grind a tool.

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specifications including
price and delivery.

No. 118

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PRECISION ANTI-FRICTION BEARING SPINDLES
FOR EVERY PURPOSE

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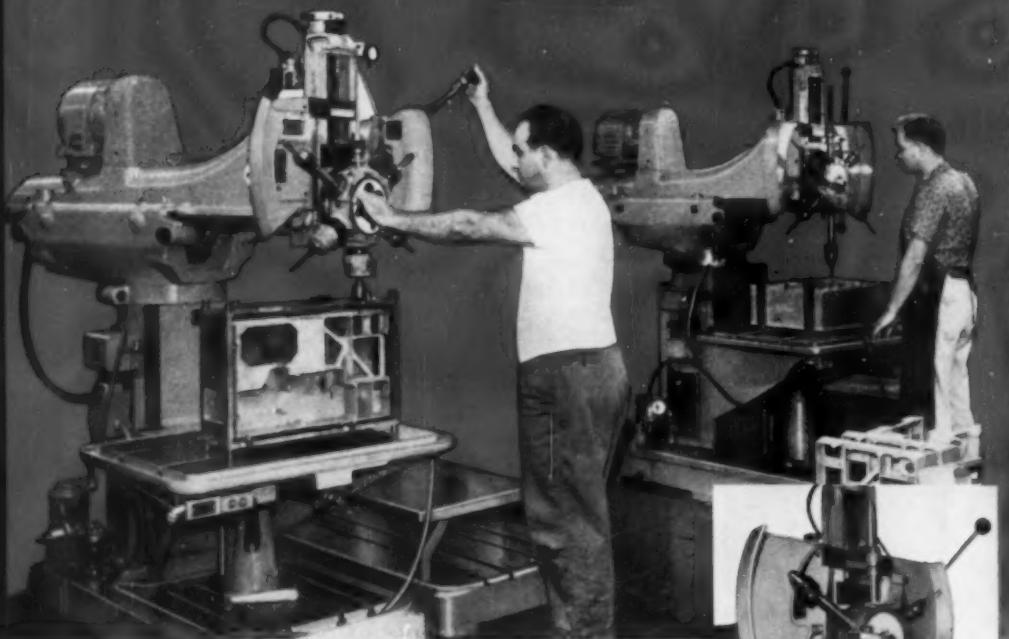
1930

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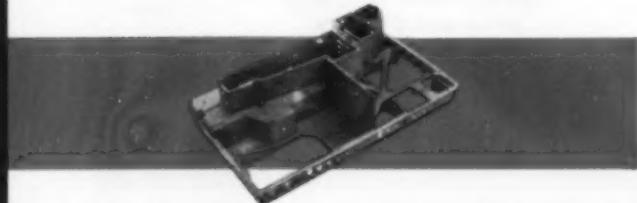
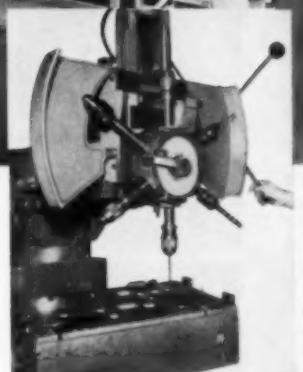
December, 1960

63

INSTRUMENT BASE PRODUCTION **BURGMASTER**



Two Radial Turret Drills perform drilling, reaming, tapping and counterboring operations on Electronic Instrument Bases. Each operation is performed at optimum cutting speed since the spindle speeds are individually preselective and automatically shift as the turret indexes.



Electronic Instrument Base has 128 holes and requires 58 tools to perform 187 machining operations.

The Radial Turret Drill is quickly swung into each position to perform all operations in a setup without shifting the heavy fixture. The automatic action of the power indexed turret materially increases production with less operator fatigue and puts 6 spindles in 1/3 the floor space.

INCREASED 180% at Beckman Instruments, Inc.

World's Largest
Builder of Turret
Drilling Machines

Two Burgmaster Radial Turret Drills have greatly simplified complex machining operations on an Electronic Instrument Base at Beckman Instruments, Inc., Fullerton, California. 58 tools are required to perform 187 operations on 128 holes using the two Burgmaster Turret Drills. The operations include drilling, reaming, tapping and counterboring. Total average floor to floor time on both machines is 2.83 hrs/part compared to 8.00 hours using single spindle drills and jig boring equipment, a production increase of 180%.

These Radial Turret Drills can be moved quickly from one hole center to another and eliminate work shifting during a setup. Further simplification accounting for major savings is the automatic indexing turret which rapidly performs up to six machining operations with individual pre-selective spindle speeds and depth of cuts that shift with each index. The range of spindle settings is from 125 to 3000 RPM so that for any material or type of tool each operation is performed at best efficiency for accuracy, fine finish and long tool life.

JOB FACTS

Company: Beckman Instruments, Inc.
Machines: Two Burgmaster 6-Spindle Radial Turret Drills.

Part: Cast Aluminum Electronic Instrument Base.

Lot Size: 300

Accuracy: $\pm .001$ reamed holes,
 $\pm .005$ c'bore depths.

Holding: Box fixture.

Machine Operations Summary: 58 tools used for 187 operations on 128 holes. Operations include drilling, reaming, tapping and c'boring.

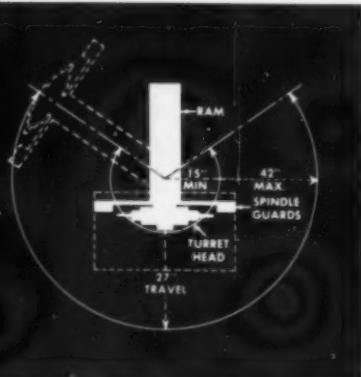
Production Rate:

Alternate method: 8 hrs/part on drill and jig borer.

Present method: 2.83 hrs/part on two Burgmaster Radial Turret Drills.

Production Increase: 180%

Other Advantages: Much less work shifting and in-process transfer; less tool changing; less operator fatigue; 2/3 less floor space required.



The Burgmaster Radial 6-Spindle Turret Drill has a 3/4" drill and tap capacity in steel. The radial sweeps a radius of 14" minimum to 2" maximum through 250° over a 24" F to B by 36" L to R table. The ram rolls on large double row ball bearings and is easily positioned by one hand from the handle on the turret. Releasing thumb button hydraulically locks all units rigidly in place prior to advancing the spindles to the work.



Write for Bulletin for complete description and specifications of the Burgmaster Model 2BR Radial Turret Drill. Also available at no obligation is a 40 minute 16mm sound film showing all Burgmaster Turret Drills in action.



10" Manual Power Index 1/2" Capacity



10" Manual Power Index 1/2" Capacity



20" Manual Power Index 1/2" Capacity



20R Ram Type Radial Drill 1/2" Capacity



20H Automatic Hydraulic 1/2" Capacity



30H Automatic Hydraulic 1/2" Capacity



30AH Automatic Hydraulic 1/2" Capacity



25AH Automatic Tape Controlled 1/2" Capacity



25HT-30HT Automatic Tape Controlled 1/2" and 1 1/2" Capacity

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MANUFACTURING COMPANY, INC.

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Bus dealer representatives in other industrial centers.

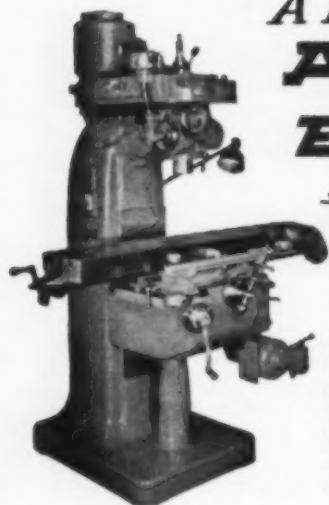


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POWER

A Lot More

**ACCURACY
ECONOMY too!**

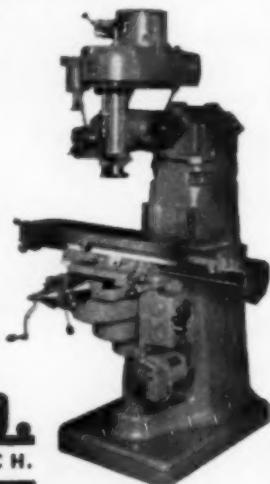


INDEX "SUPER 55" VERTICAL MILL

- 1½ HP Head or optional 2 HP with continuous duty motor gives 50% or more capacity . . . More rigidity, more accuracy . . . Increased horse power and dynamically balanced Cast Iron Pulleys and Drive System afford improved production capacity . . . More weight in the column, heavier ribbed column, heavier knee, heavier saddle.

INDEX "45" VERTICAL MILL

- Unique square design of overarm affords more rigidity, greater accuracy . . . Provides extra range and capacity . . . More power at the cutter. No adjustment required on overarm and head after use . . . No need to re-indicate head after moving overarm . . . Speed range with nine changes makes possible the use of high speed or carbide tipped cutters to best advantage.

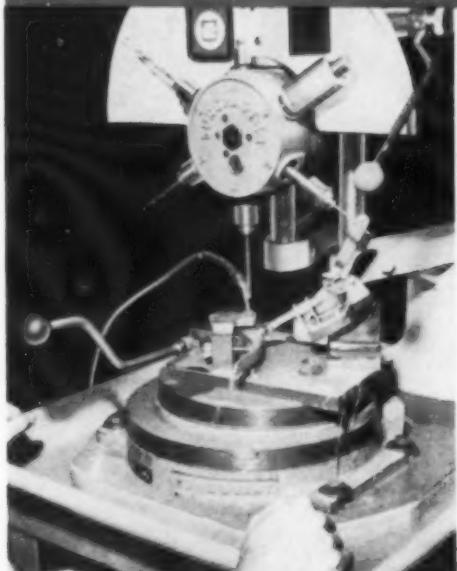


INDEX MACHINE CO.

543 N. MECHANIC ST., JACKSON, MICH.

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PLIER PRODUCTION INCREASED from 87 to 165 per hour

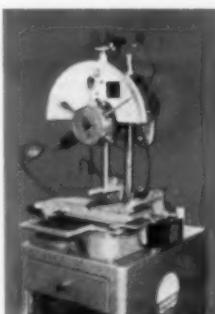


The setup at Owatonna Tool Co. uses a positioning table on a Burgmaster Bench Model Turret Drill for 4 operations in plier part: drill and ream 7/32; drill #19; drill 3/32. Special mounting elevates machine uprights for greater depth capacity.

Write for Free Literature on Burgmaster Model Turret Drills and Rapid Positioning Table. Representatives in principal cities.

A Burgmaster Bench Model Power Indexing 6-Spindle Turret Drill has replaced a manually indexed competitive Turret Drill for drilling and reaming 3 holes in Plier parts at Owatonna Tool Co., Owatonna, Minnesota. Production has been increased from 87 to 165 parts/hr., the comparison based on using essentially the same setup on both machines with the Positioning Table shown. The Burgmaster represents an 86% smaller investment, yet is faster because the turret power indexes at operator command to quickly perform up to six operations. Individual pre-selected spindle speeds assure optimum cutting of each tool.

Burgmaster Rapid Positioning Table mounted on Bench Model Turret Drill provides positive positioning with greater speed and flexibility. Table can handle complicated hole patterns because all operations are visible. Positioning accuracy $\pm .0005"$, capacity 4" x 5", price \$675.00. Burgmaster Bench Model Turret Drill $1\frac{1}{4}$ " capacity in steel, price \$595.00. F.O.B. Los Angeles, California.



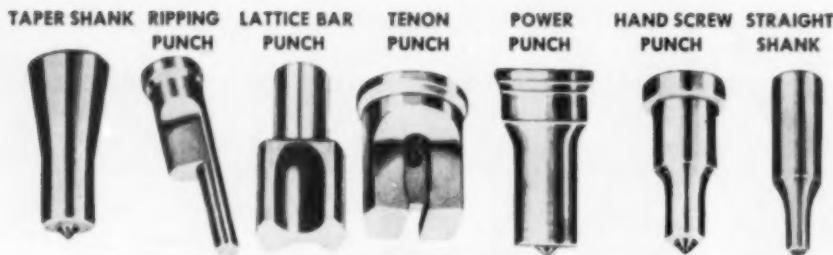
BURGMMASTER CORPORATION

SMALL TOOL DIVISION - BURG TOOL MANUFACTURING CO., INC.

15001 S. Figueroa St., Box 311, Gardena, Calif. • Phone: FAcility 1-3510 — Phone, wire or write Dept. O.A.

World's largest manufacturer of turret-type drilling and tapping machines.

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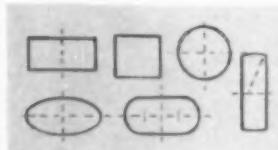


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Specify CLEVELAND
STANDARD • SPECIAL
PUNCHES and DIES**



From the smallest
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PROMPT DELIVERY

Save on inventory! 400 sizes
of 21 standard punches ready for prompt
shipment from stock. Save time! Save
money!



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For any of these shapes
or for your particular re-
quirements, simply send us
your sketch with principal
dimensions. You'll be pleased
with our prompt delivery.

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Punch and Die
Handbook No. 12.

Here's **WHY** You Save Money
Using CLEVELAND Punches

**Cut Tool
Set-Up Time!**

Only with CLEVELAND
punches and dies can you
punch ANY size hole from $\frac{1}{8}$ " to $1\frac{1}{4}$ " with the SAME coupling nut and
punch stem! No buttons, no filler blocks, no make-shifts necessary!



Less Down-Time! Cleveland punches are interchangeable—quick and easy to insert or remove.

Last Longer! Punch or notch sheets, strip, angles, channels or
extrusions—you'll find CLEVELAND punches and dies are tough,
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Pay LESS for Cleveland punches—made in quantity, no stock
wasted.

A-104-A



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PUNCH & SHEAR WORKS CO.**

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**Power Presses • Punching Tools and Dies
Plate and Structural Steel Fabricating Tools**

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NEW Reciprocating Electrolytic Tool Grinder

MICRO-FINISHES
CARBIDES, CUTS
DIAMOND-WHEEL
USE 80%



60-83

Because its reciprocating wheel just "wipes away" the carbide particles, Ex-Cell-O's Style 264 Electrolytic Tool Grinder reduces diamond wheel consumption by as much as 80 per cent! With one set-up, tools can be precision-finished to better than 15 micro-inches—free from heat checks, cracks or burns caused by abrasive contact.

The Style 264 grinds the cutting edges of carbides and other super-hard tool materials at one end, grinds chip breakers at the other. Wheel stroke is fully adjustable. Standard equipment includes: Ex-Cell-O Precision Spindle with inbuilt reversible motor, universal chip breaker Rotor (shown in circled inset), and pressure system for electrolyte.

Write direct, or see your Ex-Cell-O Representative for details on the Style 264, conventional Style 142 Reciprocating Tool Grinder, and others in the complete Ex-Cell-O line.

EX-CELL-O
CORPORATION
DETROIT 22, MICHIGAN

XLO
EX-CELL-O FOR PRECISION
Machinery Division

PRECISION MACHINE TOOLS • GRINDING AND BORING SPINDLES • CUTTING TOOLS • RAILROAD PIPE AND
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December, 1960

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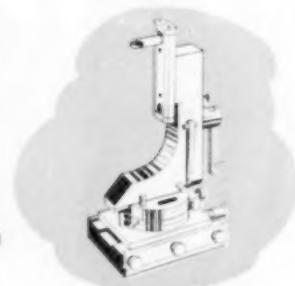
J & S
TOOL CO., INC.

You get day - in
with J & S

14. WHEEL DRESSERS

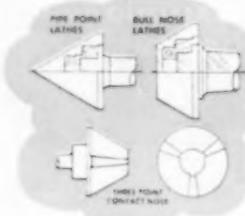
Hardened, ground & lapped. .0001" accuracy. Form wheels to shape on surface grinders, tool and cutter grinders, cylindrical grinders.

Model RHC 24 shown



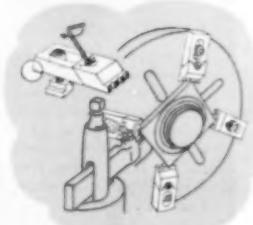
15. LATHE CENTERS

Pipe Point, Bull Nose and 3-Point Contact Lathe centers in large range, specially made to meet individual needs. Free running for stationary quills and solid for revolving quill spindles.



16. DOWN-HOLDING DEVICES

All purpose jaw clamps eliminate U-clamps, straps, and fingers. Made of hardened tool steel throughout. Typical lathe application with Standard Lo-Grip clamps shown.



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day - out economy precision - crafted products

J & S FLUIDMOTION Wheel Dressers

Dress tangent in one continuous motion—two angles tangent to concave or convex radii—concave radius of 180°. Simple dressing of complex forms with .0001" accuracy for all types of surface and cylindrical grinders. Also new compound micrometer wheel guard adapts Model F in an inverted position on surface and visual grinders.

Special Lathe Centers for Modern Requirements

J & S special centers are precision-made and individually designed to suit the ever growing needs of modern requirements. In conjunction with the Pipe Point and Bull Nose centers, the 3-Point Contact centers are unique for conditions where the inside diameter of tubing or pipe runs out of round. They eliminate the movement of the part that occurs when an elliptical hole rotates on a true full round Bull Nose or Pipe Point center.

Down-Holding Devices for Any Requirement

A large variety of J & S All-Purpose Jaw Clamps makes fixture building a profitable business. They allow faster and more powerful set-ups (one adjusting screw has a holding force of 2½ tons on the small model; to 12 tons on the Jumbo model). Compact and efficient design eliminates the usual obstruction problems.

Literature and data on request

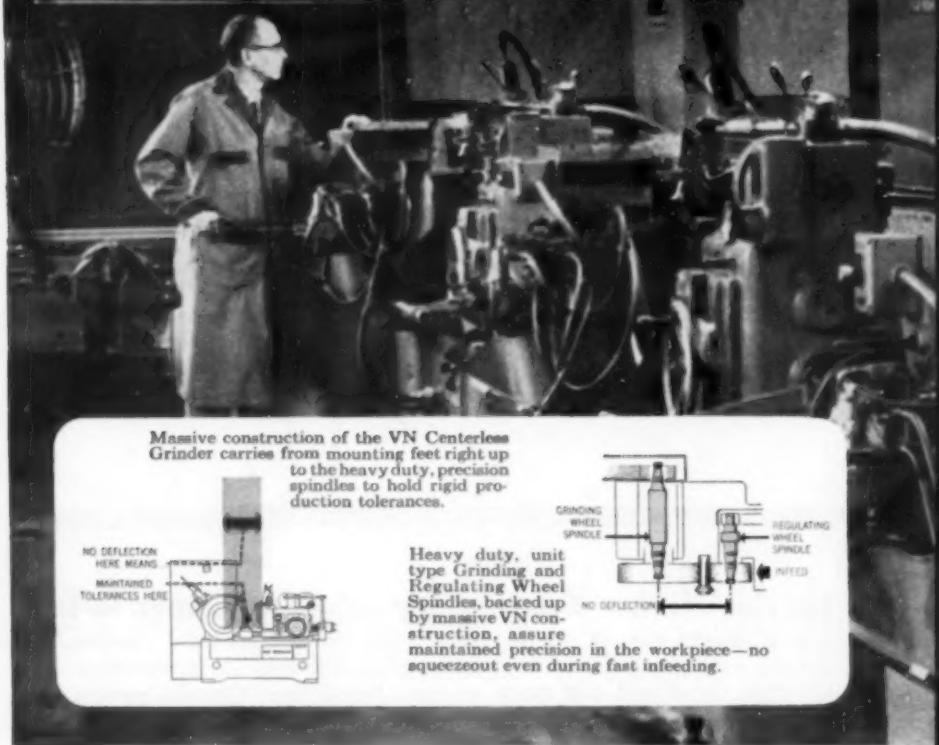
Specify product No. listed opposite illustration

J & S TOOL CO., INC.

882 DORSA AVE., LIVINGSTON, N. J.

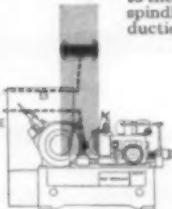
WYman 2-3181

All industry is talking about the new Van Norman

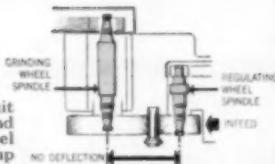


Massive construction of the VN Centerless Grinder carries from mounting feet right up to the heavy duty, precision spindles to hold rigid production tolerances.

NO DEFLECTION
HERE MEANS
MAINTAINED
TOLERANCES HERE



Heavy duty, unit type Grinding and Regulating Wheel Spindles, backed up by massive VN construction, assure maintained precision in the workpiece—no squeezeout even during fast infeeding.



NEW VAN NORMAN GRINDER

VN 2C Centerless Grinders turn out famous cutting tools

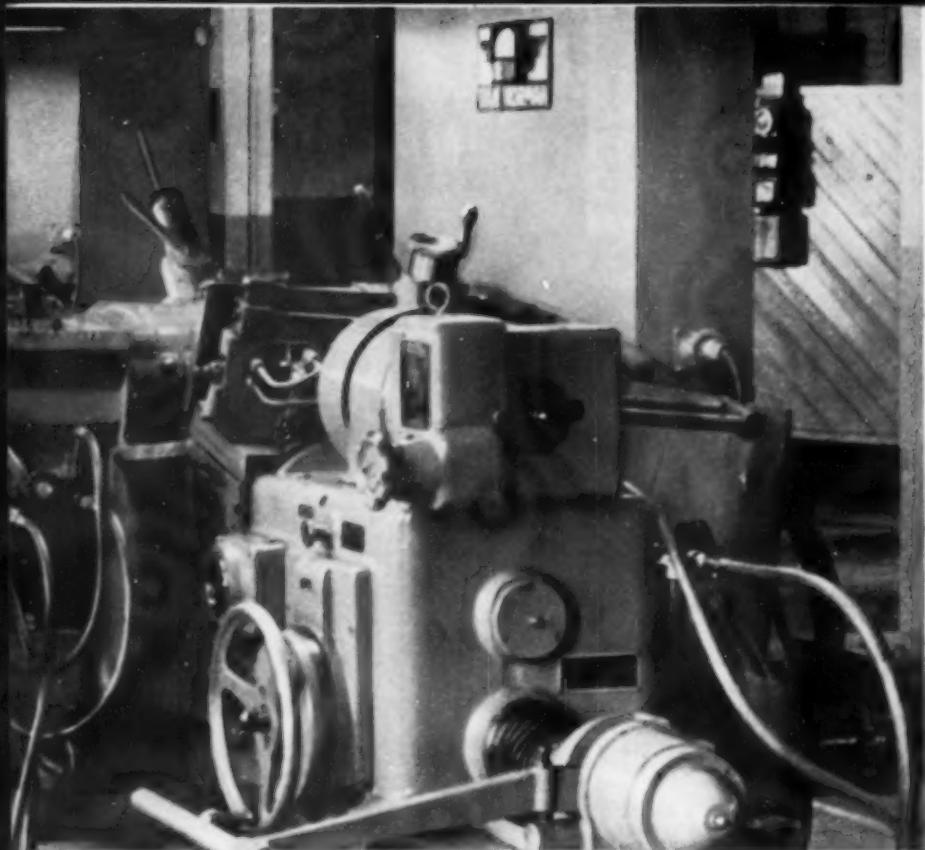
Production rates at Morse Twist Drill and Machine Co., in New Bedford, Mass., boomed when new Van Norman 2C Centerless Grinders were put to work. One of these rugged, heavy-duty machines actually combines the output of three centerless grinders! What's more—one man at Morse can set up and operate three VN 2C's simultaneously to turn out

5,000 precision-ground drills an hour. Previous box score: one man; one machine; only 800 drills an hour.

300% Faster Output To Close Tolerances—Work speed is hand-wheel regulated, gives an infinite RPM range to regulating wheel drive. The grinding wheel—large 24 x 8 x 12 inches—is profile diamond dressed, and increases machine

VAN NORMAN

SPRINGFIELD 7, MASSACHUSETTS



TRIPLES PRODUCTION AT MORSE

with spectacular speed, versatility, precision, economy

efficiency by producing more pieces per dressing. Special tooling provides automatic operation for grinding with hopper feeding, and a unique unloading method. Traditional Morse quality is maintained by holding tolerances of 0.00025.

On Any Job, More Work Per Operator Per Work Shift—with the fast, versatile, accurate, cost-cutting VN 2C Centerless

Grinder. Thru-feed or infeed. Capacity 0" to 4 $\frac{1}{2}$ " diameter. Van Norman unit-type, anti-friction bearing spindles on both grinding and regulating wheels. Optional: VN Crush Dressing Attachment.

Free Booklet—"Centerless Grinding"—valuable guide to high production, lower costs. For your copy, contact factory or your local distributor.

MACHINE COMPANY

A DIVISION OF VAN NORMAN INDUSTRIES, INCORPORATED



2381

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December, 1960

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Announcing the NEW

EXCEL

No. 6A UNIVERSAL CUTTER AND TOOL GRINDER

Quick-set tilting lock

Fine adjustment for tilt

Clearance angle
graduations
in degrees

Swivel lock

HEAD TIETS AND SWIVELS

— a time-saving feature
that enables you to

- grind practically all clearance angles with cup wheels
- grind most cutters and reamers all over with a single setup
- get proper clearance angles on slab mills, face mills, angular cutters.

Swings work 8" diameter

Right-Hand or Left-Hand
Table Operation

Elevating Hand Wheel
Below Table Level

Precision Ball
Bearing Spindle



\$1450

F.O.B.
Benton Harbor,
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Micro-Precision

a Covel Tradition — — —

Since 1874

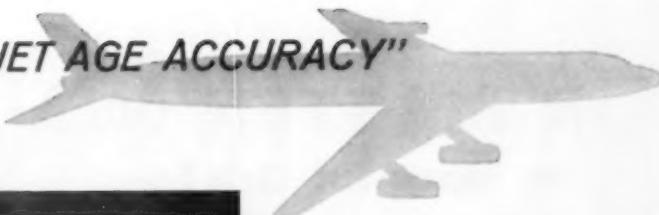
**PRECISION
GRINDERS**

Write, wire or call TODAY
for full details on Excel
No. 6A and the complete
line of Covel Precision
Grinders. Ask for Bulletin
BB-120

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MACHINE and TOOL BLUE BOOK

for "JET AGE ACCURACY"



**Grinding & Finishing • Engraving & Marking • Tool Maintenance
Filing • Buffing & Polishing • Sanding & Brushing
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The Sensitive Altimeters made by Kollsman Instrument Corporation must give altitude readings of complete accuracy throughout a wide range of pressures and temperatures, and Foredom Flexible Shaft Machines help assure this precision. In the photograph shown here, a Kollsman craftsman uses a bench model Foredom machine for one of the many delicate finishing operations required on an altimeter mechanism body.

Foredom's slim handpieces respond to the slightest pressure and give perfect control at all speeds. And there's nothing better for getting into small openings and other inaccessible spots. If you work on metal, plastic, leather, rubber, wood or glass, there's a Foredom machine and handpiece ideally suited to your operation.

For more information, write for catalog 210-M12

FOREDOM ELECTRIC COMPANY, INC.
Manufacturers of miniature power tools
BETHEL, CONNECTICUT

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December, 1960



AIR MASTER Says to Harmful Grit!

Grit is the enemy of costly machines, and of manpower, too. Put a stop to this menace with the AIR MASTER.

Trapped as they leave the wheel of your grinder or buffer, flying particles are filtered out by fabric and steel wool bags. Only grit-free air is discharged. AIR MASTER is self-contained, ruggedly built for long years of trouble-free service.



There's an AIR MASTER model for every grinder and buffer. Give your plant this protection NOW!

Write today! Ask for name of your distributor or Bulletin

We also manufacture a complete line of Grinders and Buffers



THE **CINCINNATI** ELECTRICAL TOOL CO.

306 MT. HOPE AVE. • CINCINNATI 4 • OHIO

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features in this issue



YOUR CHOICE OF MACHINE INFLUENCES THE COST OF THE PART

This month machine tool selection is examined from the viewpoint of economics. Harry Conn, in his column on ENGINEERING & TOOLING, analyzes the three main cost factors that make up much of your product's selling price and how these factors should influence the choice of machines.

.....Page 81

NEW ELECTROSHAPING PROCESS MACHINES TOUGHEST ALLOYS

A report on a new process that has been proven in the production of complex jet engine compressor blades. The process differs from previous electro-machining processes and lends itself to duplicating all of the common metal-shaping operations currently in use.Page 106

INSPECTING THE COMPLETED DIE—A 25-point check list to aid

the die builder or user to qualify dies for production runs is offered by Paul Prikos in his column, THE PRACTICAL DIE-MAKER. There's more to it than just producing a few sample parts when proving dies.Page 91

YOU DON'T REALLY NEED SO MANY PUNCHES!

—concludes Hard-ing Hugo in his explanation of how "high limit sizing of open tolerance holes" has resulted in excessive use of special sized punches where standard sized punches adequately meet all requirements.Page 116

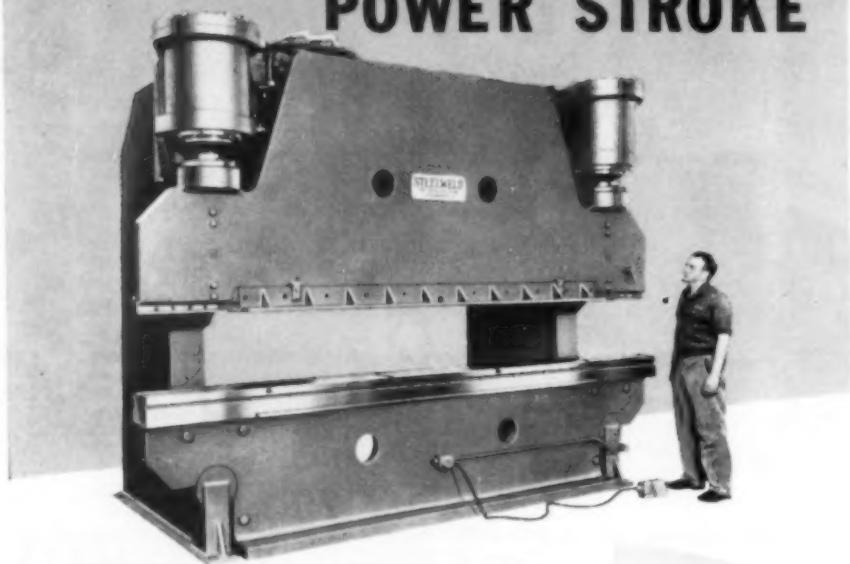
HERE'S A NEW APPROACH TO TURNING WITH CARBIDE INSERTS

as developed at Lockheed Missiles and Space Division. The new approach is a chart that is used as a visual aid for the firm's lathe operators. Considerable increases in production have resulted, along with good surface finish and tool life.Page 99

A BREAK-THROUGH IN MACHINING WITH WIDE-BELT COATED

ABRASIVES has been announced jointly by Wallingford Steel and Behr-Manning. The break-through enables Wallingford to produce machined quality stainless steel strip with minimum crown height.Page 122

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CHRISTMAS EDITORIAL

Prove all things; Hold fast that which is good

I Thessalonians 5:21

Do we need to be admonished, at this Christmas season, to prove our faith and our belief in God? In the broader sense, is it necessary to prove our trust in liberty and freedom? Konstantin said, "The hero never ceases to prove his courage and his faith; when he merely accepts he becomes a mouse among the lions."

Isn't religion, and the freedom of religion, you and me believing and trusting in God, proving and living a life worthy of Him? It is not a church or a set of rules. Isn't democracy and liberty you and me believing it, proving it with our thoughts and actions? It is not a thing called government or political party.

Too often we forget the individual, thinking we are but idle dust motes drifting aimlessly in a black vastness. We truly are motes, if we think we are! Yet, the Divine hand touched us all, a flame of greatness burns within each of us, it is but for us to prove it. Too often we cover this divine spark under shabby thoughts, half-hearted attempts, small fits and starts and ignoble purposes. Too often we aspire to material gains, tossing aside deeper spiritual values, handling greatness like a pumpkin after Halloween. This is neither proving ourselves and our beliefs, nor holding fast to that which is good.

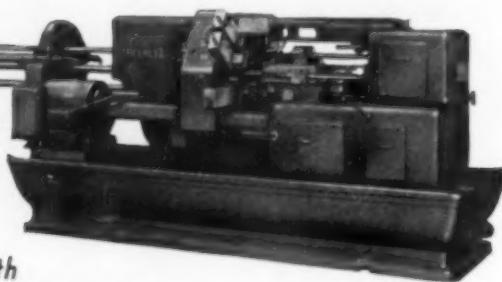
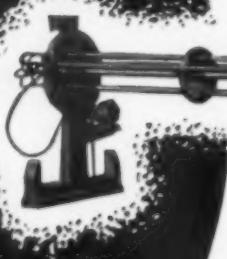
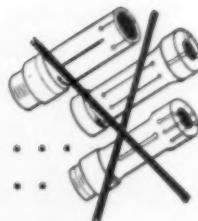
I sometimes think that Christmas is generally such a happy time for the majority of people because each person feels a little closer to his Creator, feels the warmth of the Divine hand which guides, and each is a little more anxious to prove these things and hold fast, if but for the brief life of the candle, these things which are good.

Prove all things—the love we bear our neighbors, the love we bear one another. Are we not of the same family? And if we prove these things at Christmas time, can we not prove them throughout the year? Let us hold fast to this—hold desperately fast to our God, our liberty, our democracy and above all—our dignity as men.

From the board of directors, the president, the entire staff of the Hitchcock organization may we wish you a truly happy Christmas and a new year filled with all the good things of life.

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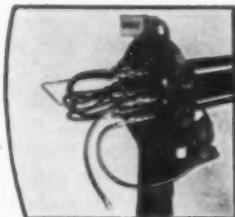
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3

ENGINEERING and TOOLING



When more than one machine will do the job . . .

Your Choice Of Machine Influences The Cost Of The Part

- How do you choose or select the correct machine for machining production piece parts? While it is mechanically possible to perform such operations as keyway cutting, grinding, boring, facing, tapping and milling on an engine lathe, the economical soundness of doing each of them on a production basis on a lathe would be archaic to say the least.

In this article we will derive a system of computing which machine to assign to a job when several different kinds of machines will perform the operations successfully. As an example we shall choose between a turret lathe, a single spindle automatic, and a multiple spindle automatic.

There are obviously some types of work that, because of unusual job characteristics, definitely belong on hand operated machines. It is not our intention to consider that kind of work in this article, but rather those which, from an operating standpoint, may be run on more than one machine; thus the basis of machine selection will be

CREATIVE ENGINEERING

The choice of machine tool should be the result of computation, not whim

entirely a question of economics.

Too often this problem is the victim of over simplification, or of utter disregard. An example of over simplification when computing the cost of machining for any one machine is to multiply the standard cost per piece times the number of pieces, add the set-up cost and then divide that total by the number of pieces for the unit cost, or

$$\text{Machining Cost} = \frac{\text{Standard Cost} \times \text{Number of Pieces} + \text{Set-Up Cost}}{\text{Number of Pieces}}$$

THREE MAIN COST FACTORS

There are three main cost factors that must be obtained, computed, and then added to obtain the selling price. The three main costs are tooling cost, set-up cost, and the manufacturing dropping cost. These must then be added to the material cost to arrive at the selling price of the item.

I. DROPPING COST

A system of computing cost and choosing the correct machine must be practical and usable. The most practical method of deriving a manufacturing dropping cost is to decide how much money you must obtain from a given machine per hour. This figure should include direct labor, depreciation, profit, and various and sundry expenses such as engineering, inspection, sales, and administration. If it is decided that a \$50,000.00 multiple spindle automatic should yield a return of \$15.00 per hour running at 85% efficiency, with a yield of 300 parts per hour, the manufacturing dropping cost would be \$.05 per piece. In the \$15.00 per hour return, the manufacturer should have a target amount of profit. A \$15,000.00 machine should not have the same rate of return per hour as a \$50,000.00 machine.

It is most convenient to figure how many machine hours are needed to make a thousand pieces, multiply by the hourly rate in dollars that has been assigned to

the machine, and then divide by a thousand for the dropping cost per piece. The thousand quantity for a basis of computing cost is used instead of machine cycle time because over a run of a thousand pieces you will have an enlightened estimate of tool change cost, tool grinding cost, tool depreciation cost, and stock loading cost evaluated over a quantity necessary to include tool changes and stock loading. The quantity of 1000 is not needed for turret lathe computations. The production value of the machine per hour in dollars divided by the net number of pieces per hour will be the dropping cost.

EXAMPLE OF AUTOMATIC DROPPING COST COMPUTATIONS

$$\text{Dropping Cost} = \frac{\text{Hours per thousand} \times \text{Rate per hour}}{1,000}$$

$$\text{Dropping Cost} = \frac{8 \times \$12.00}{1,000} = \$0.096$$

If this theory of dropping cost is not acceptable, then use what is called standard cost, but then mark upwards. Administration, sales, inspection costs must be added.

II. SET-UP COST

Set-up cost is the second factor that must be taken into consideration. The longer the production runs, the less this factor. Regardless of its importance, it must be recognized, especially when making short runs. Unfortunately most manufacturers are plagued with limited quantities which make it mandatory to include an accurate set-up cost in the selling price.

If it has been decided that \$15.00 must be derived per hour from a machine, and it takes 8 hours to set-up the job, the set-up cost will be at least \$120.00. Most manufacturers, compute set-up cost on the basis of direct labor, *but it is wrong*. If it takes one hour to set-up a \$15.00 per hour machine, your realistic cost is \$15.00 not the \$3 direct labor hour cost.

EXAMPLE

$$\text{Set-Up cost per piece} = \frac{\text{set-up hours} \times \$\text{per hour}}{\text{number of pieces}}$$

$$\text{Set-Up cost per piece} = \frac{8 \text{ hours} \times \$15.00}{3,000 \text{ pieces}} = \$0.04$$

ENGINEERING & TOOLING continued

III. TOOLING COST

After the number of pieces has been decided, the tooling cost for the various machines in question must be determined. In Figure 1 is shown a piece part that can easily be machined on the three types of machines that are listed. If the shop is a jobbing shop, the tooling should be amortized during the job for which the tools were purchased. This may seem rather a high tool cost, but it is realistic. Many shops have many special tools around and also many standard tools but very little money. It must be decided whether to make money or to have every known tool available. Naturally many standard tools can be applied to almost all future jobs such as

BAR STEEL B-1113		RETURN PER HOUR OR PRODUCTION VALUE PER HOUR
METHOD A	SURRET LATHE	
TIME PER M	.61 HR.	
SETUP TIME	.4 HR.	\$3
TOOLING COST	\$25 (APPROX.)	
METHOD B	SINGLE-SPINDLE AUTOMATIC *	
TIME PER M	.55 HR.	\$5
SETUP TIME	.5 HR.	
TOOLING COST	\$45 (APPROX.)	
METHOD C	SIX-SPINDLE AUTOMATIC **	
TIME PER M	.7 HR.	\$12
SETUP TIME	.16 HR.	
TOOLING COST	\$125 (APPROX.)	
* ONE OPERATOR CAN HANDLE THREE TO FOUR MACHINES		
** ONE OPERATOR CAN HANDLE TWO MACHINES		

1. After the number of pieces has been decided, the tooling cost for the various machines in question must be determined. Shown here are the tooling costs for manufacturing the part on three different machines. This tooling is made up mostly of perishable tools and cams, but some other types of tooling are included.

floating holders, drill chucks, gages, etc. It is not that type of tooling we are referring to when suggesting they be amortized per contract or run.

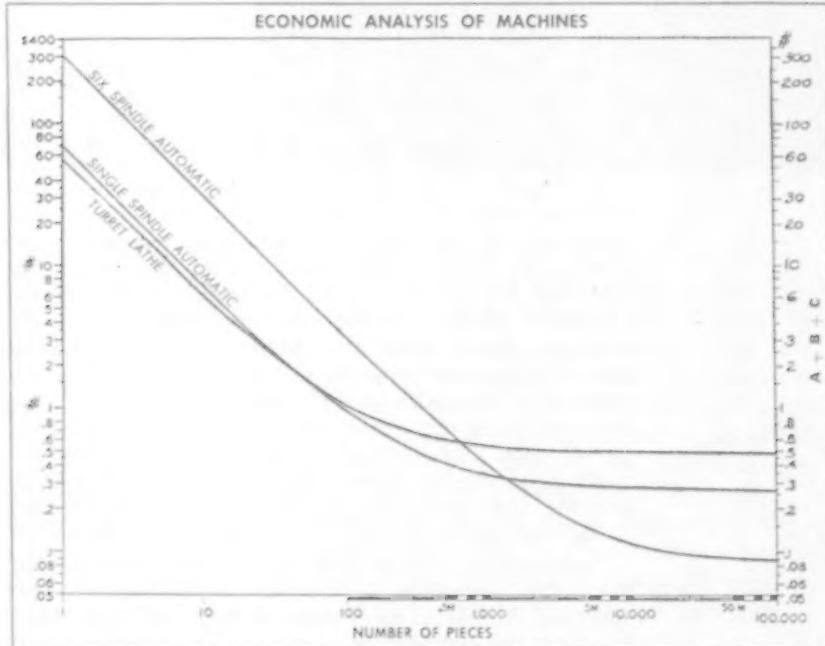
For instance, Figure I shows the tooling cost for manufacturing the part on three different machines. This tooling cost is made up mostly of perishable tools and cams, but some other types of tooling are included. If 4,000 parts are going to be machined, the tooling cost must be divided by the number of pieces to derive the tool cost per piece.

EXAMPLE

$$\text{Tool Cost in \$}$$

$$\text{Tooling cost per piece} = \frac{\text{Number of pieces}}{\$45.00}$$

$$\text{Tooling cost per piece} = \frac{4,000}{\$45.00} = \$0.01$$



2. Tooling cost, set-up cost, and manufacturing dropping cost computed and charted for the three different machines. Add the material cost and material mark-up cost to the figure in the vertical scale to find the sales price. Note that there are three different break-even points on the graph and the amount of savings possible at a particular quantity of one machine over another.

EXAMPLE

2,500 PIECES AS SHOWN IN FIGURE I

MULTIPLE SPINDLE

(A) Mfg. Dropping Cost Per Piece	
7 hrs. per M \times \$12.00	
	_____ = \$.084
1,000	
(B) Set-Up Cost	
16 hrs. \times \$12.00	
	_____ = \$.077
2,500	
(C) Tool Cost Per Piece = \$.05	
\$125.00	
	_____ = \$.05
2,500	
(A) + (B) + (C)	
.084 + .077 + .05 = \$.211	

SINGLE SPINDLE

(A) Mfg. Dropping Cost	
55 hrs per M \times \$5.00	
	_____ = \$.275
1,000	
(B) Set-Up Cost	
5 hrs \times \$5.00	
	_____ = \$.01
2,500	
(C) Tool Cost Per Piece	
\$45.00	
	_____ = \$.018
2,500	
(A) + (B) + (C)	
.275 + .01 + .018 = \$.303	

Multiple Spindle Saves \$.092 Per Piece on a 2,500 Piece Run.

ANALYSIS OF MACHINES

In Figure II, which is on log-log scale, the three different machines, their tooling cost, set-up cost, and manufacturing dropping cost has been computed and charted. The total, which contains dropping cost, tooling cost, and set-up cost, are on the vertical scale and the number of pieces is on the horizontal scale. To find the total per piece, locate the quantity on the horizontal scale, then project vertically to the line representing the machine to be used, and then project horizontally to the left or right for the manufacturer's selling price per piece less material cost. Add the material cost and material mark-up cost to the figure shown in the vertical scale to find the sales price. Figure II is graphic presentations of the cost factors in Figure I at various quantities.

From a graph or chart such as this it is easy to discern the break-even point in number pieces between two machines. The break-even point is the number of pieces at which the cost will be the same for either machine. This graph shows three methods of making a part, and there are three different break-even points on the graph. This method not only shows the break-even points, but portrays the amount of savings at a particular quantity

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of one machine over another.

Some screw machine product manufacturers say they would put a job on a multiple spindle automatic if they had a twenty hour run, others say thirty-five hour etc. It is not quite that easy, but if one will do about 5 minutes of figuring using the method shown in this article they can know the savings of one machine over another at any given quantity.

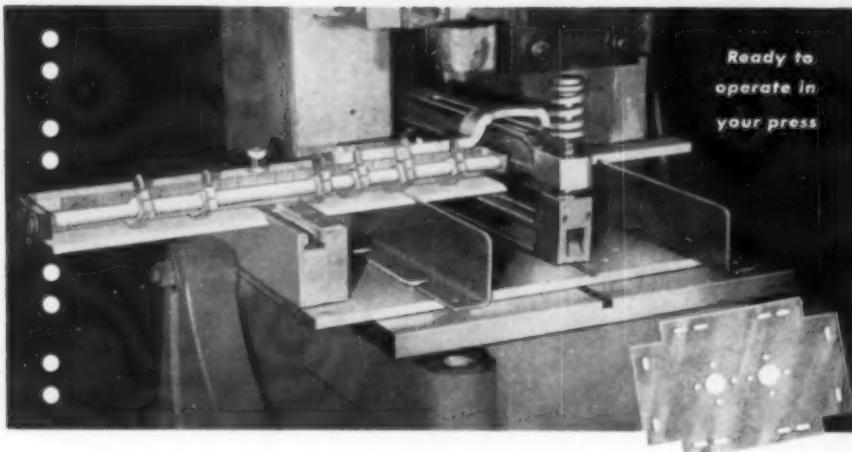
The fourth cost is that of material. It should consist of the direct material cost, plus a mark up to cover cost of purchasing, freight, handling, storage, etc. We will designate the material cost as D. The selling price is determined by adding A + B + C + D.

CURVE CHARACTERISTICS

The curves shown in Figure II will in various shops, where varied amounts of money are expected from a machine per hour, have higher or lower initial cost in the ordinate or vertical scale. Regardless of the differences of estimating tool and set-up cost, the characteristics of the curves will be the same in all shops. In other words, when properly tooled, the manufacturer's dropping cost for a job that is suitable for a multiple spindle will always show a lower cost if enough pieces are made. In effect the lines will always cross, but in different plants they will cross at varied quantities and costs. The main point to understand is that each of the three machines can be the correct machine, depending on the quantity involved and the choice should be the result of computation, not whim, prejudice or personal preference. • • •

DON'T BE SURPRISED when you pick up your copy of the January issue . . . and see a big bold "CAUTION" on the wrapper. It is just a reminder that January is "verification month" for this magazine. Please fill out the form on the January wrapper and mail the entire wrapper to us. It is vital to our audit . . . and will assure your continued receipt of this magazine.

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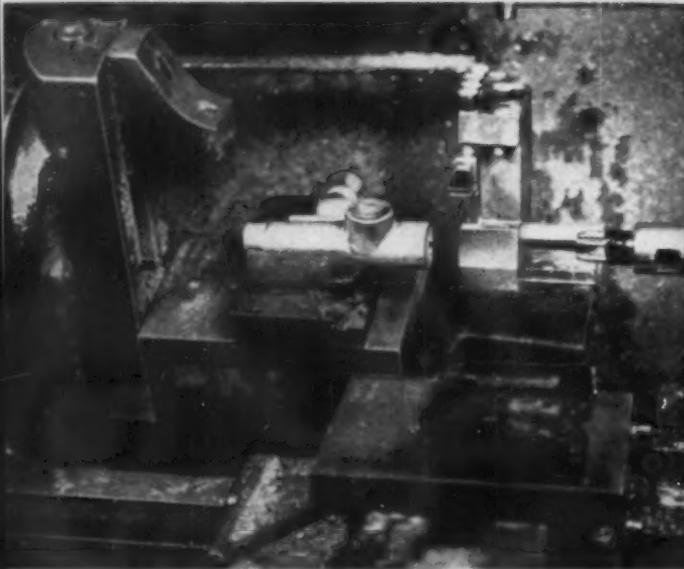
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By **Paul Prikos**
Prikos & Becker Tool Company
Skokie, Illinois

THE PRACTICAL DIEMAKER



Inspecting The Completed Die

Here's a 25-point check list to qualify dies for production runs

■ During the past few months we have discussed how to train a diemaker, how to estimate dies, and most recently how to arrive at the hourly price for diemaking. All this naturally leads up to the completed die. How do we ascertain its true value with respect to the price to be paid for the die? At the risk of disenchanting some of our readers, may I say that there is no reason to set up a camouflage of statistical controls which may or may not prove the worth of a die.

Unlike a product that is inherently the same over and over again, dies are never the same. Even when two dies are built identically (for example a replacement die) each die still has to be touched up differently from the other to make an operative die. Often a die running in one press will react differently when placed in a different tonnage or different speed press.

The ideal method of inspecting a die is to have a drawing of the complete die, and then have the die disassembled and checked out accordingly. However, this method only proves whether the die is or is not built to the print. All points may check out, but the die still may not work. Nevertheless, it is a preliminary check that will reduce the amount of non-anticipated faulty workmanship.

CRAFTSMANSHIP ENGINEERING

Two dies may look alike, but dies are never quite the same

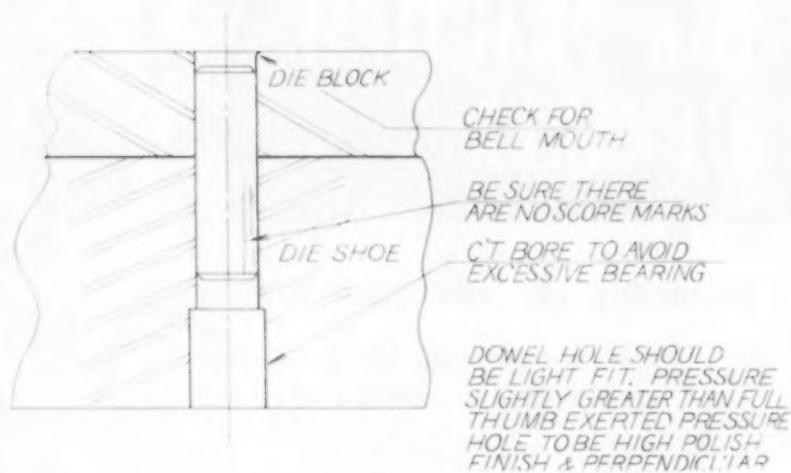


FIGURE 1

My thoughts on a practical (not foolproof) method of die inspection could be set up according to the following checking and inspection methods:

1. When the diemaker says the die is complete give it an over-all visual inspection for appearance and safety.
2. Set up the die or dies in a punch press and provide a pilot run of about 200 pieces, observing constantly the freedom with which the die operates. Take special care in seeing that the piece part is easily ejected without interference and that slugs are going through the die without piling up.
3. Always save the last sample part and the last strip if the die is progressive, and compare them for burrs and over-all workmanship.
4. Inspect the piece part, of course.
5. Open the die on the inspection bench and give the dowels a good going over. See Figure 1.
6. Look at several of the screws and make certain they seat flat, including any stripper bolts. See Figure 2.
7. Are all non-cutting and non-working edges of the die broken, to avoid injury to any person handling the die?
8. Is the die set good, fitting with no slop on the leader pins, and

does it check out reasonably accurately within an over-all .003"-.004" indicator reading? (Special applications of extreme accuracy not considered here.)

9. Are all nests, such as in form dies, close fitting to piece part contours?
10. If the die is progressive, do pilots pick up the stock or strip properly?
11. Is starting arrangement adequate for the particular die?
12. In cutting dies, do all slugs come through the die with ease?
13. Are there any "whiskers" or slivers, indicating a mismatch in the strip?
14. Are all ejection or K.O. arrangements in form or compound die of proper design and free acting?
15. Does the shedder of a compound die allow for two to three blanks in the event of doubling by the operator? Also, is the shedder protruding from the die face by about .010" to .015" as it should?
16. Does the die have adequate amount of spring pins in the perforation or notching punches?
17. Is the spring pressure proper and adequate, not borderline in all dies requiring springs?

18. In cutting dies, is the taper and clearance correct and accurate?

19. Is the die built of the proper die steel and is it sufficiently "beefed" up?

20. Are all hardness requirements up to necessary Rockwell?

21. Is the die stamped with adequate information? Sometimes a brass descriptive tag with special information to the press setup man is of great value.

22. In draw dies, are drawn radii sufficient to prevent cracking? Check that conditions are not borderline.

23. Is the progression and stock width most economical?

24. Are the dies or die built in line with your press conditions?

25. Check the die for over-all balance and proportion.

• • •

One can be quite certain that other checks could be added to the above list, but, in avoiding undue refinement, the twenty-five points should qualify the majority of dies for acceptable production runs.

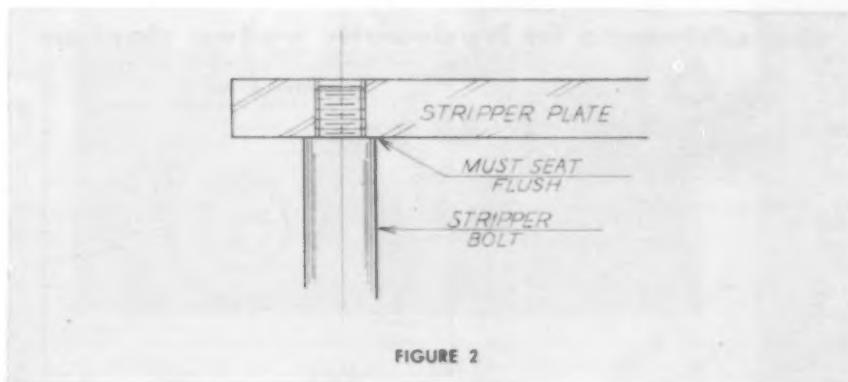


FIGURE 2



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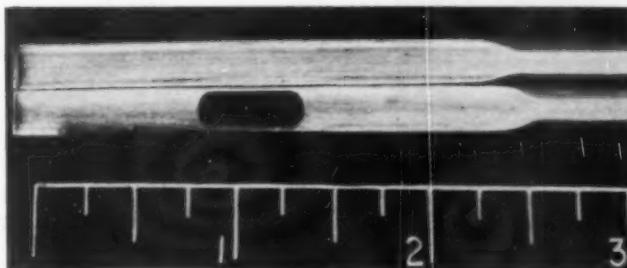
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PROCESS ENGINEERING

Don't Overlook Explosive Forming, It's Now Applied To Common Metals

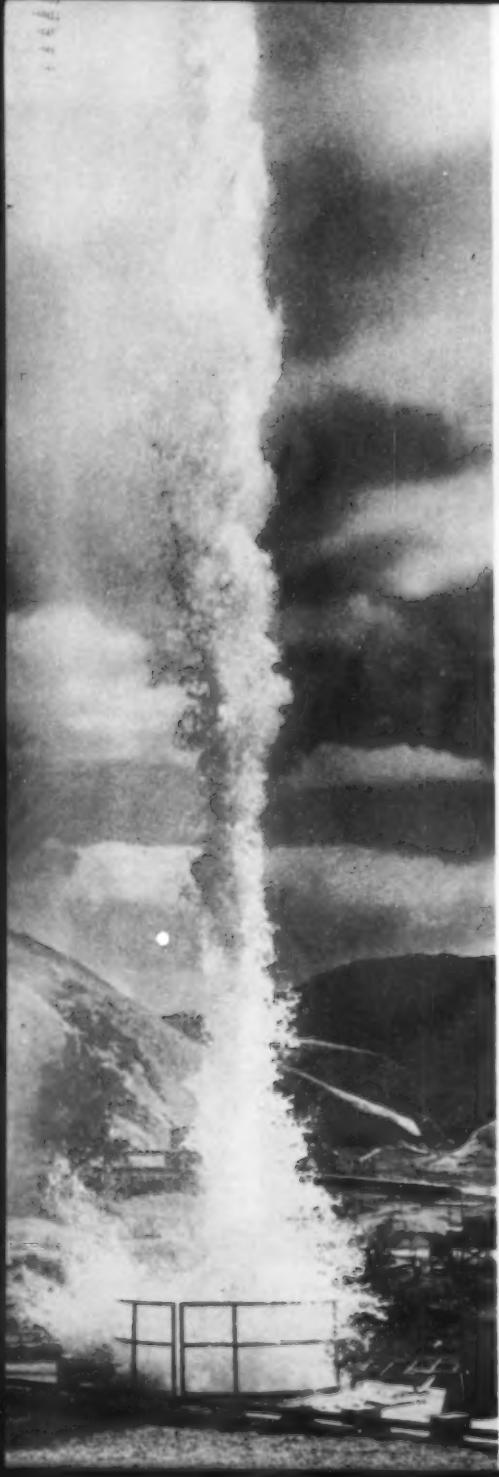
■ Explosive forming, which has been considered as a process directed toward working difficult, high-strength materials, is now being used competitively in the production of parts made of common metals. Production forming of common metals at costs competitive with other methods was recently announced before a national meeting of the American Society for Metals by Rocketdyne, a division of North American Aviation, Inc.

Dr. L. C. Struckenbruck, supervisor of Rocketdyne explosive forming activities, said of his firm's applications,



ENDS OF THRUST CHAMBER TUBES are explosively formed by Rocketdyne. Produced in large quantities, the ends are squared to close tolerance. Savings of \$10,000 over other processes have been reported.

PROCESS ENGINEERING continued



"Our thrust chamber tubes are made from nickel and 20CB steel. We have used explosive forming to square the ends of more than 2,000 tubes to close tolerances with negligible rejections and at savings of about \$10,000 over other processes.

"In many instances, explosive forming is the only method by which newer, more difficult parts can be formed. One example of this is the turbine manifold shroud that we are forming out of René 41 for the F-1 one-and-a-half million pound thrust engine.

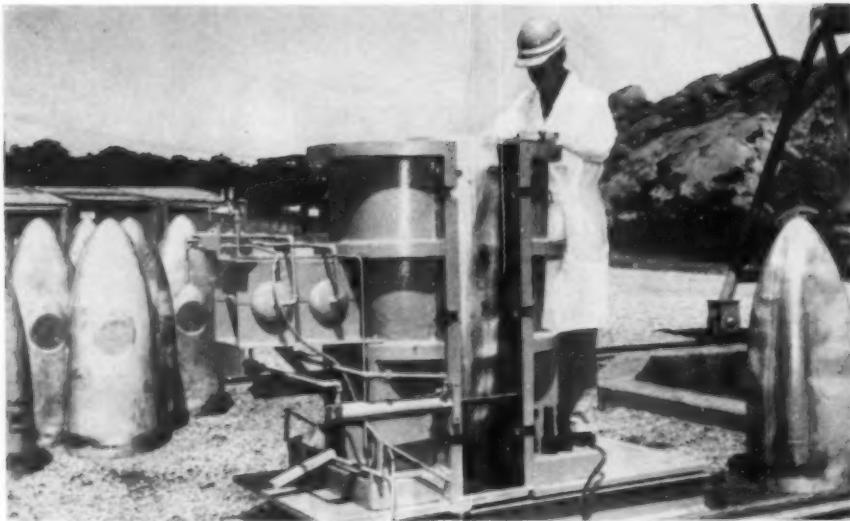
"Much of the saving that is possible with explosive forming is in the cost of dies. Stiffeners for a large bulkhead for the B-70 airplane were formed explosively with a single female die at a saving of almost \$500,000 in tooling cost over that required to form the parts by drop hammer, using male and female dies.

"Speed is another important factor in considering explosive forming. For example, we were able to form a small thrust chamber for a rocket engine only 36 hours after it was decided to begin fabrication of a die."

Successfully formed parts range in size from the small tube ends that have a diameter of $\frac{1}{4}$ " to large parts of more than 5 feet in diameter. Besides high strength materials, such as René 41 and titanium, Rocketdyne has formed parts from stainless steel and 6061 aluminum (T-4) and from other common metals and plastics.

* * *

PICTURESQUE GEYSER OF WATER rising from forming pit after charge is set off looks like Old Faithful.



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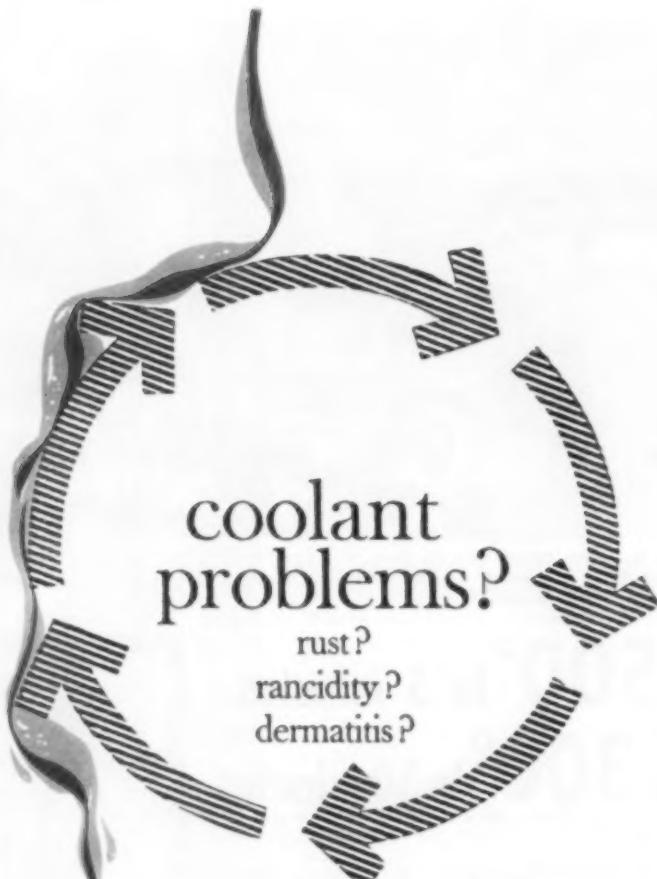
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December, 1960

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CUTTING TOOLS

Here's A New Approach To Turning With Carbide Inserts

By **A. Incardona**, Production Methods Engineer
and **H. H. Poett**, Manufacturing Research Engineer
Lockheed Missiles & Space Division
Van Nuys, California

■ Production Methods Engineers at the Van Nuys Plant of Lockheed Missiles and Space Division have compiled a chart which has made obsolete all previous data available on turning with the use of carbides. The chart is used as a visual aid for our lathe operators.

Considerable research has gone into the compilation of the chart, and in many instances, speeds and feeds are in excess of newly established criteria. Speeds and feeds are compiled for average work on medium-sized engine lathes. Results from the usage of the chart give good surface finish and good tool life.

Considerable increases in production at Lockheed Missiles and Space Division have been accomplished by the use of the chart illustrated in Figure No. 1. It has been prepared for the use of throwaway carbides only, and included are the various families of metals on which the carbide inserts are used. The type of cut, diameters being turned, RPM, depth of cut, feed range, grade insert or equivalent, type holder, surface speed and coolant used are indicated. Cutting speeds or surface speeds for

TURNING WITH CARBIDE INSERTS continued

turning depend on many factors such as property of the material being cut, the tool material, tool life that is desired, the depth of cut, the feed, the rigidity of the work and the tool,

and the available horsepower. Thus, speeds and feeds should always be the maximum available on a machine commensurate with available horsepower, workpiece, or machine rigidity.

LATHE CHART FOR THROW AWAY CARBIDES
VAN NUYS METHODS ENGINEERING & DEVELOPMENT

MATERIAL TO BE CUT	TYPE OF CUT	DIA. OF PART * RANGE							
FREE CUTTING & CARBON STEELS. CLASS 1006-1050 # 1109-1213	INTERRUPTED ROUGHING	687-1432	344-716	229-477	172-358	138-305	115-238	86-179	69-143
	GENERAL USE	1432-2101	716-1050	477-700	358-525	305-420	238-349	179-262	143-210
	FINISHING	1910-2674	955-1337	637-889	478-665	382-532	318-448	238-316	191-256
		2292-3438	1146-1719	764-1143	573-855	458-681	382-576	266-432	229-342
ALLOY STEELS 4130-4340 ETC. & STAINLESS 403 TO 502	INTERRUPTED ROUGHING	382-954	191-477	127-318	95-239	76-191	64-159	48-119	38-95
	GENERAL USE	954-1432	477-716	318-477	239-358	191-286	159-238	119-179	95-143
	FINISHING	1337-1910	668-955	455-637	334-478	267-386	222-318	167-238	134-191
		1719-2674	859-1337	572-889	429-665	343-532	286-448	215-336	172-266
STAINLESS STEEL 18-8 TYPE 201 TO 300 (AUSTENITIC)	INTERRUPTED ROUGHING	267-534	134-267	90-178	67-133	54-107	45-89	33-67	27-53
	GENERAL USE	610-1146	305-573	204-381	152-286	122-229	102-191	76-143	61-115
	FINISHING	1528-2101	573-811	381-541	286-425	229-324	191-270	143-201	115-162
		1623-2101	764-1050	509-700	382-525	305-420	254-349	191-262	153-210
CAST IRON	ROUGHING	687-1337	344-668	229-445	172-334	138-267	115-222	86-167	69-134
	GENERAL USE	1337-1719	668-859	445-572	334-429	267-343	222-266	167-215	134-172
	FINISHING	1623-2292	811-1146	541-764	405-573	324-458	270-382	203-286	162-229
ALUMINUM & MAGNESIUM	ROUGHING	1337-2900	668-1440	445-955	334-720	267-575	222-480	167-158	134-286
	GENERAL USE	2900-7643	1440-3821	955-2547	720-1910	575-1528	480-1273	358-595	286-764
TITANIUM ALLOYS	GENERAL USE	687-1146	344-573	229-381	172-286	138-229	115-191	86-143	69-115
	FINISHING	1146-1528	573-764	381-509	286-382	229-305	191-254	143-191	115-153
BRASS & BRONZE	GENERAL USE	1719-2674	859-1337	572-889	429-665	343-532	286-448	215-336	172-266
	FINISHING	2292-3438	1146-1719	764-1143	573-855	458-681	382-576	266-432	229-342
"K" & "S" MONEL & MONEL	GENERAL USE	763-1337	382-668	254-445	191-334	153-267	127-222	96-167	76-134
	FINISHING	1146-1719	573-859	381-572	286-429	229-343	191-266	143-215	115-172
INCONEL	GENERAL USE	382-763	191-382	127-254	95-191	76-153	64-127	48-96	38-76
	FINISHING	687-1146	344-573	229-381	172-286	138-229	115-191	86-143	69-115
INCONEL-X	GENERAL USE	267-458	134-229	89-152	67-115	54-92	45-77	34-58	27-46
	FINISHING	382-763	191-382	127-254	95-191	76-153	64-127	48-96	38-76
BON-METALLICS FIRE CLARS	GENERAL USE	1528-2480	764-1240	509-828	382-620	305-496	254-414	191-310	153-248
	FINISHING	2101-3438	1050-1719	700-1143	525-855	420-684	349-576	262-432	210-342

and required finish.

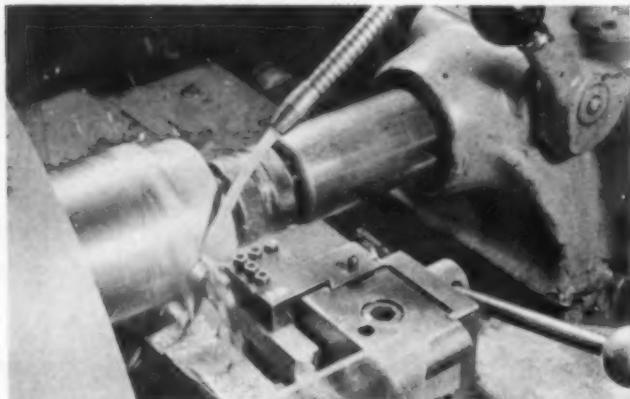
By its very nature, the chart cannot cover every single example that might occur. However, careful consideration has been given to factors which one might label as "average" and extremes can be sought for any

situation. Common sense will enable an operator to either increase or reduce, one or more controlling factors on the chart.

Much of the work done at the Missiles Division consists of low production quantities and for experi-

4-20-60									
Prepared by: A. Incardone Dept. 43/72									
DIA. OF PART *	DIA. OF PART *	DIA. OF PART *	DIA. OF PART *	*FOR INTERMEDIATE DIAMETERS NOT LISTED, USE THE R.P.M. GIVEN IN THE PREVIOUS DIAMETER COLUMN					
R.P.M.	R.P.M.	R.P.M.	R.P.M.	DEPTH	FEED	GRADE	EQUIVA- LENT	TYPE HOLDER	SURFACE SPEED
RANGE	RANGE	RANGE	RANGE	OF CUT	RANGE	INSERT			COOLANT
57-119	49-102	38-80	31-65	1/4-5/8	.015-.030	K21	370-	NEG.	180-375
119-175	102-150	80-116	65-95	7/32-3/8	.012-.020	K21-K4H	370-	NEO/POS	375-550
159-224	136-191	106-148	87-121	1/8-3/16	.009-.015	K4H	350-	NEG/POS	500-700
191-288	163-245	127-191	104-156	1/64-3/32	.005-.008	K7B	350-	POS.	600-900
32-80	27-68	21-53	17-43	1/4-5/8	.015-.030	K21	370-	NEG.	100-250
80-119	68-102	53-80	43-65	7/32-3/8	.012-.020	K21-K4H	370-	NEO/POS	250-375
111-159	95-136	74-106	61-87	1/8-3/16	.009-.015	K4H	350-	NEG/POS	350-500
143-224	123-192	96-148	78-121	1/64-3/32	.005-.008	K7B	350-	POS.	450-700
22-45	19-38	15-30	12-24	1/4-1/2	.015-.030	K21	370-	NEG.	70-140
51-95	44-82	34-64	26-52	7/32-3/8	.012-.025	K21-K4H	370-	NEO/POS	160-300
95-135	82-116	64-90	52-74	1/8-3/16	.009-.015	K4H	350-	POS.	300-425
127-175	109-150	85-116	69-95	1/64-3/32	.005-.008	K7B	350-	POS.	400-550
57-111	49-95	38-74	31-61	7/32-1/2	.020-.040	K21	370-	NEG.	180-350
111-143	95-123	74-96	62-78	1/8-3/16	.013-.025	K21-K4H	350-	NEO/POS	350-450
135-191	116-163	90-127	78-104	1/64-3/32	.005-.012	K7B	350-	POS.	425-600
111-238	95-205	74-159	65-130	5/16-5/8	.020-.040	K21	370-	POS.	350-750
238-637	205-546	159-425	130-348	1/8-1/4	.010-.025	K4H	350-	POS.	750-2000
57-95	49-82	38-64	31-52	1/8-7/32	.012-.020	K4H	370-	POS.	180-300
95-127	82-109	64-85	52-69	1/64-3/32	.008-.012	K7B	350-	POS.	300-400
143-224	123-191	96-148	78-121	5/32-1/4	.012-.020	K4H	370-	NEG/POS	450-700
191-288	163-245	127-191	104-156	1/64-1/8	.006-.012	K7B	350-	POS.	600-900
64-111	55-95	42-74	35-61	1/8-7/32	.010-.020	K4H-K21	370-	NEO/POS	200-350
95-143	82-123	64-96	52-78	7/64-3/32	.005-.010	K7B	350-	POS.	300-450
32-64	27-55	21-42	17-35	1/8-7/32	.008-.015	K4H-K21	370-	POS.	100-200
57-95	49-82	38-64	32-52	7/64-3/32	.004-.008	K7B	350-	POS.	180-300
22-38	19-33	15-25	12-21	1/8-7/32	.008-.015	K4H-K21	370-	POS.	70-120
32-64	27-55	21-42	17-35	7/64-3/32	.004-.008	K7B	350-	POS.	100-200
127-207	109-177	85-138	69-113	1/8-1/4	.009-.015	K4H	370-	POS.	400-650
175-288	150-245	116-191	95-156	7/64-3/32	.004-.008	K7B	350-	POS.	550-900
SOLUBLE OIL									

**Confronted by a problem in a lathe area,
a Production Methods & Development Group
improves on old speed and feed concepts**



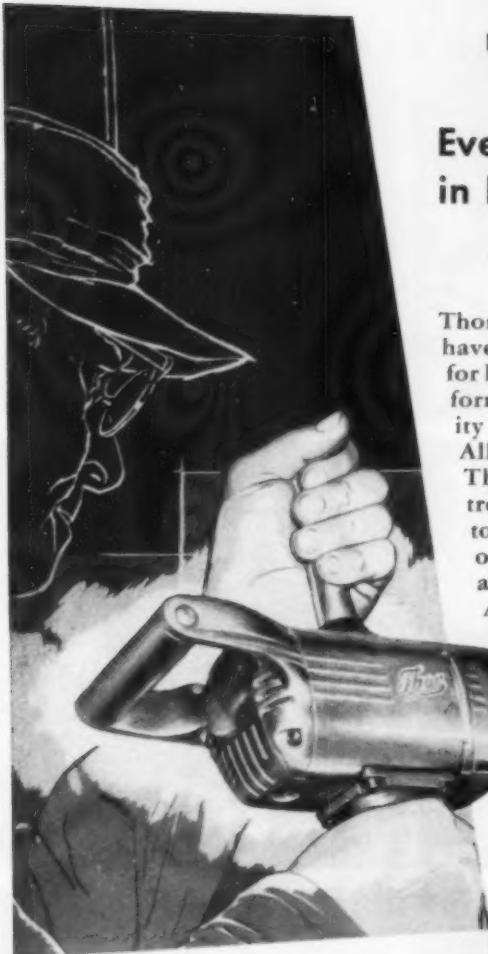
An example of the program in action. The criteria presented have all been successfully attained, not only in tests but also in production runs.

mental vehicles. And, the material being turned is generally of the high strength alloy family. Tolerances are often tight and finishes must be fine. It is therefore imperative that machines must be in good condition to be able to operate at their maximum efficiency. Preventive maintenance is an important factor when production schedules must be maintained and often exceeded. (Much of the success of the Polaris program is attributed to "getting the work out.")

The attitude in the shop is of great importance. Close relationship among Production Methods Engineers, Shop Supervision, and the operators is essential. The Production Engineers' role is to provide the optimum method by which to do a particular job or jobs. This optimum method

involves various factors which we must consider: materials, equipment, schedules, available manpower, plant layout and capability, and many other items. Shop supervision's backing and cooperation are extremely important in an over-all program. One of the most important factors, and one often neglected, is the follow-up program to insure the continued use of the improvement instituted.

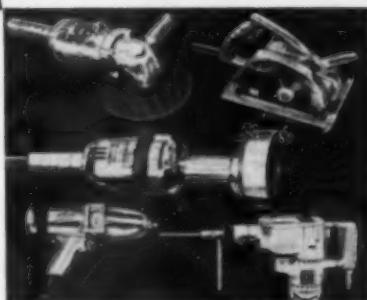
The efforts of the Production Methods Engineers are constantly directed toward simplification and cost savings. This chart is one endeavor which has resulted in tremendous savings and full utilization of existing equipment. The program offers a challenge to the "generally accepted method," and can place a shop well ahead of the field. • • •



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Here's one job ideally suited to electroshaping, that of machining jet turbine blades. Blade on left is in "as forged" condition; blade at right after shaping. Material is Waspalloy. Height is 11½".

New Electroshaping Process Machines Toughest Alloys

Its future looks promising because the process is capable of duplicating all conventional metal-shaping operations.

■ There is a new development in electrolytic machining. Some people call it revolutionary; they expect the process to answer a number of critical problems created by the very hard, very tough, and frequently very heat-sensitive materials which have come into use with the arrival of the space age.

The new electrolytic machining process has been developed by Battelle Memorial Institute in research supported by Steel Improvement and Forge Company, of Cleveland. Metal is removed without arcs, sparks, or high temperatures by passing direct current between the workpiece and an electrolyte. The current removes electrons from the workpiece, converting the surface atoms into positively charged ions that dissolve into the electrolyte.

This process is unique in that its effectiveness is not dependent on the hardness of the metal and, thus, it offers a solution to the problem of machining the "unmachinable"—the harder, higher-strength metals. "The process is also potentially capable of duplicating all of the common metal-shaping operations in use today," said Dr. C. A. Snavely, General Manager of Sifco Metachemical, Inc., a subsidiary of Steel Improvement. "It

adds a new type of operation which promises designers much wider latitude in the choice of metal shapes which can be made economically.

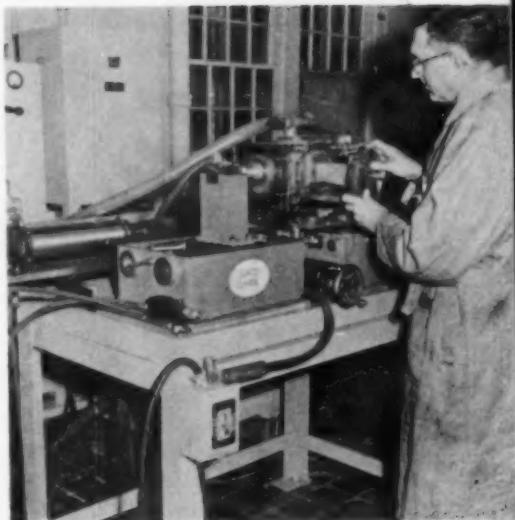
In the new metal-removing shaping method, to which Steel Improvement has given the name "Sifco Shape," a cube-shaped, plastic-fabricated chamber is used to hold the part to be machined plus electrodes made in the size and shape to be duplicated. An electric current, passed from workpiece to electrodes through a rapidly-flowing chemical solution, does the metal removing. There is no metal-to-metal contact, and no "tool" wear, as with other machining methods.

Metal removal rates are governed by the amount of electric current applied, and varies with the type of metal to be machined and the work area to be covered.

To produce a part, a rough forging or piece of metal stock (anode) is placed between shaped electrodes (cathode) and electrolyte is pumped under pressure into the space between the electrodes and the workpiece. As the electric current dissolves the workpiece to the desired shape, the electrodes are moved in simultaneously.

The electrolytic unit has machined rough forged jet turbine blades to .003" tolerances in 5 to 10 minutes—an operation which took from 1 to 2 hours to perform by grinding!

Because there is no tool pressure on the workpiece, very thin sections can be shaped without deformation and lightweight machines and clamping systems can be used. In the dramatic example of the turbine blades, the process electroshapes the airfoil's leading and trailing edges as



This is one of smaller "Sifco-Shape" machines fitted to machine forged turbine blades. (Above), the blade is held in a special fixture which is inserted into the machine's plastic-walled shaping chamber. (Below), All it takes is a couple of minutes to precision shape the turbine blade. In all, more than 15,000 finished blades of various sizes and materials have been made.



thin as .005". The material is wasp-alloy.

The development of this electrolytic machining process is the result of over two-and-a-half years work by a Battelle research team which included Dr. Charles L. Faust, chief of electrochemical research at the Institute; Dr. John A. Gurkis; and John E. Clifford.

The Battelle-developed process differs from other processes which use the electrolytic metal removal principle in that: (1) it can produce complete parts in addition to sinking cavities, (2) it uses no rotating cutting wheels, (3) power is supplied through a simple rectifier instead of complex electronic circuits.

Current requirements range up to 1500 amps per square inch of work-piece at 3 to 12 volts, to achieve a penetration rate of .050" to .100" per minute. The median operating range is from 100 to 500 amps.

In announcing his company's latest development, C. H. Smith, Jr., President of The Steel Improvement and Forge Company, pointed out that the equipment is definitely well out of the laboratory stage. Several of the new machines are set up and are operating on a production basis and have successfully produced more than 15,000 jet engine compressor blades across 16 different designs. Over-all savings in machining costs are said to be significant.

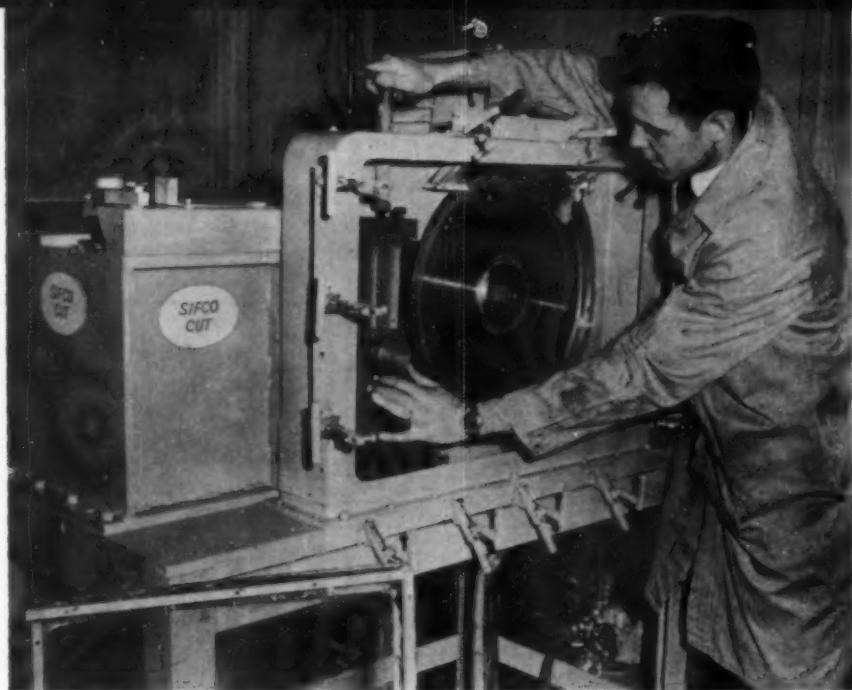
The approach followed at Steel Improvement up to this date has been to produce a slightly oversize forg-

ing, allowing a band of material for subsequent removal by electrochemical techniques. This permits the use of considerably wider dimensional tolerances on the forging which results in increased die life.

While the work carried out has been mostly confined to electrochemical shaping oversize forged blades, the new process is, according to A. H. Milnes, Executive Vice President of Steel Improvement, readily applicable to castings or bar stock. The over-all tooling cost following this approach is considerably less than would be required for production as a precision forging. And, the life of the electrochemical shaping tools appears to be of considerable duration. In the case of the turbine blades, superior surface finishes are being consistently obtained, stress problems are completely eliminated, warp, bow and twist tolerance requirements can be drastically reduced, and section thicknesses are no longer a factor.

Blade materials so far electrochemically shaped by Sifco include: stainless steels, both pearlitic and austenitic grades; S-816; Waspalloy; Udimet 700; Nimonic; A-286; and V-57. Materials handled for other applications include tungsten and molybdenum.

As previously mentioned, the electrochemical process is unique in that it is potentially capable of duplicating all of the common metal-shaping operations currently in use. The reference to common metal-shaping operations includes the equivalent of:



High speed cut-off operation on a tungsten rod shows the effectiveness of this new technique. The large stainless steel electrode wheel rotates rapidly to direct—by centrifugal force—a volume of chemical solution between wheel and workpiece. An electric current, passed from workpiece to electrode wheel through a chemical solution, does the precision cutting. The wheel shown here is $\frac{1}{8}$ " thick; thinner ones will be available soon.



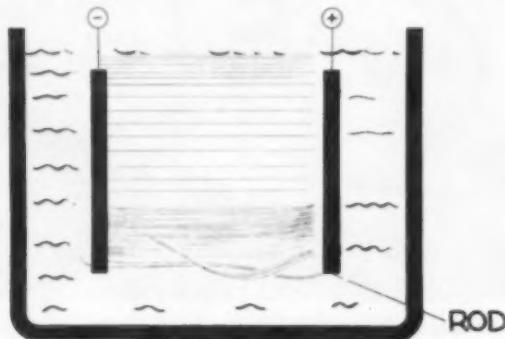
ELECTROSHAPING continued

lathe turning or form grinding; internal shaping; milling or grinding operations to obtain accurate surfaces, slots or grooves; cutoff; broaching;

drilling and deep-hole drilling; and trepanning.

At present, the new electroshaping machines are specially-designed for

HOW THE ELECTROSHAPING PROCESS WORKS*



■ The simple conditions for electroshaping of metal are met by submerging the metal workpiece and another conductor in a chemical solution, connecting the metal workpiece to the positive terminal of a d-c source from which the negative terminal is connected to the other conductor.

Electric current flow between the metal workpiece and the other conductor can be represented by lines. The greatest density of lines mean the greatest density of electric current, i.e., the greatest concentration of energy.

The speed of metal removal from a metal surface during electroshaping increases directly with an increase in direct current passed per

unit of area. This rule applies as long as the solution can supply the reactants to dissolve the metal at the rate it is being electrolytically dislodged. The maximum speed of electroshaping is reached when the amount of electric current is so great as to completely deplete the reactants and/or to saturate the solution.

Therefore, if current is permitted to flow for some time, more material is removed at points of greatest current flow. This simple shaping situation is well known to occur in electroplating and electropolishing which are slow operations relative to metal removal rates for machining, grinding, or shaping. The rate of this simple electroshaping matches the speed at which dis-

*From an explanation by Dr. Charles L. Faust, Chief, Electrochemical Engineering Division, Battelle Memorial Institute, Columbus, Ohio

specific applications. President Smith has stated that company technicians will be made available to prospective users so that it will be possible for Steel Improvement to explore and

refine the necessary procedures before installing a machine in a plant. No decision has been announced as to whether the machines will be leased or sold outright under license. • • •

lodged metal atoms in solution can diffuse away from the metal surface.

Such diffusion is a slow process and limits current flow to about 2 or 3 amperes per square inch. This corresponds to removing 0.00027" to 0.0004" of metal per square inch per minute. This, of course, is much too slow for electrolytically sawing off a billet, or for grinding off or removing up to 0.030" or more of metal in shaping surfaces of several square inches. The rate should be 200 to 500 times faster for practical metal working needs.

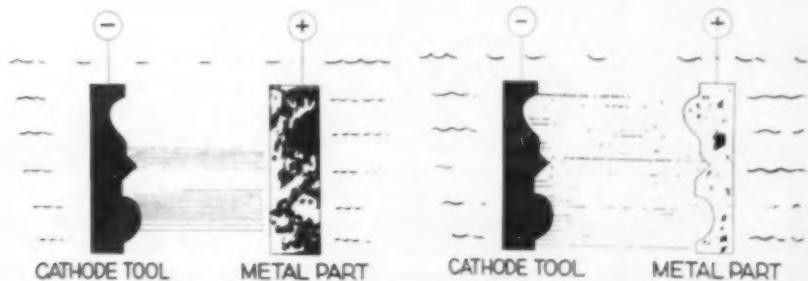
The higher rate needed is achieved by fixture designs that exchange the used chemical solution rapidly enough to support an electric current flow of up to 1500 amperes per square inch, 200 to 500 being most generally used. Now, metal removal can be done at rates of 0.050" to 0.100" per minute.

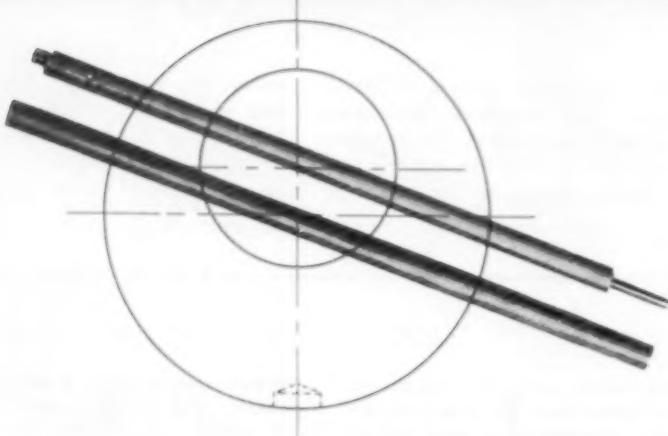
The upper limit of rate of metal

removal now is set by the maximum amperes that can be conducted into the metal and/or can be passed without boiling the chemical solution. Whenever electric current passes through a conductor, metallic or electrolyte, the resistance causes heating, which is also a factor to be controlled.

The chemical solution of most importance to electroshaping is a film about 0.003" to 0.005" thick right at the metal surface. The dislodged metal enters this film which thus must be removed and replaced with a fresh film at high rate.

A liquid flowing past a relatively stationary electrode surface undergoing electrolysis has a stagnant film about 0.002" to 0.005" thick on that surface. Special equipment designs have been devised to move and replace this film at speeds required for electrolytic shaping at the high rates mentioned above. •





**Here's what happened at IBM
when someone said**

"All You Need is Two Hollow Mills!"

A report on a special machine

By **Darrell Ward**, Engineering Editor

■ How would you set up for mass production of a rod type cam which requires eccentrically turned journals on each end and a locating set screw hole in the rod a short distance from one end? Would you make two setups in a lathe and one in a drill press? IBM engineers kicked this problem around trying to find the right machine to do the job; one which would not cost a fortune either in setup time or in capital investment.

The part is the impression control cam for adjusting key impression on the IBM electric typewriters. The cam is an aluminum rod approximately $12\frac{1}{4}$ " long x $\frac{1}{2}$ " dia. with $\frac{1}{4}$ " journals at each end eccentric to the longitudinal axis of the rod. Specifications require $0.500"$ rod $\pm 0.002"$ for the blank. Journals are $0.250" + 0.000" - 0.003"$, turned $0.031"$ off center to provide $0.062"$ total eccentricity. The locating set screw hole is $0.156", \pm 0.003" - 0.000"$, drilled $3/16"$ deep at $\frac{7}{8}"$ from one shoulder.

Since basic machines were not available to handle this part, IBM engineers designed a special machine solely for producing the one part. This was feasible because of

the continuous large volume requirements for all parts which go into an electric typewriter. The problem was to develop a completely automated operation, relatively foolproof, requiring little attention, but well capable of maintaining specified tolerances.

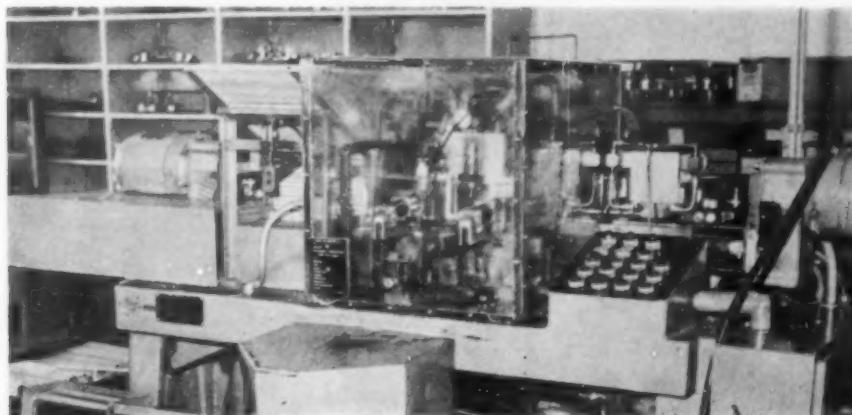
The machine was designed to hopper feed parts into a clamping fixture, move them into work position, perform simultaneous milling and drilling operations, then eject finished parts into a receiving basket at the rear of the machine.

They made expedient use of both electrically driven and air operated components for functional operations and prolific use of limit switches and relays for controlling these operations. The original machine was built by toolmaker apprentices and electronic technician apprentices at the Poughkeepsie, N.Y., plant in 1956. Modifications and improvements were later incorporated to bring the machine up

to its present form as shown in the accompanying views.

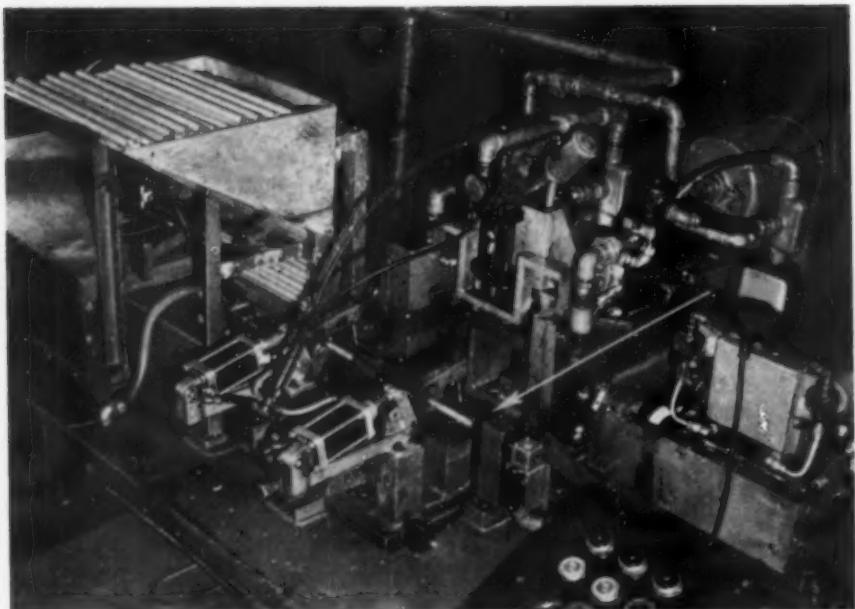
Parts are loaded by hand from stock bins trucked to the floor area. The feeding hopper holds approximately 100 piece parts. These are agitated down a vertical chute through a gate release into locating "V"-ways below the hopper. An air driven ram feeds parts into position where they are automatically clamped in the holding fixture. The fixture moves forward approximately 6" into work position. Two hollow mills (3-blade adjustable), one at each end, move into the ends of the workpiece to mill the journals.

Simultaneously, a drill head moves in from the rear to drill the locating hole on the side of the workpiece. All heads retract at the end of the cycle, the workpiece is ejected by release of the holding fixture clamp, the part falls through a chute into a catch pan, and the holding fixture

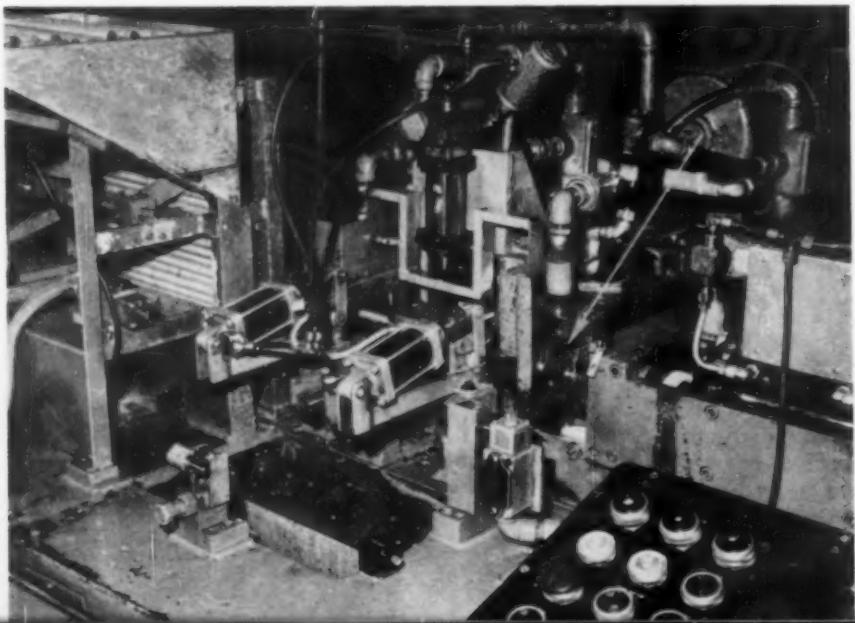


OVERALL VIEW of the machine designed by IBM engineers for machining impression control cams for their electric typewriters. The feeding hopper holds about 100 piece parts.

MACHINING ECCENTRICS continued



ABOVE: With plastic safety shield removed, chucking method is clearly visible. The clamping fixture is shown in first portion of operation cycle. BELOW: Workpiece (arrows) is carried forward into work position. The two hollow mills move in from each end and the drill moves in from the rear.



moves back to receive another part.

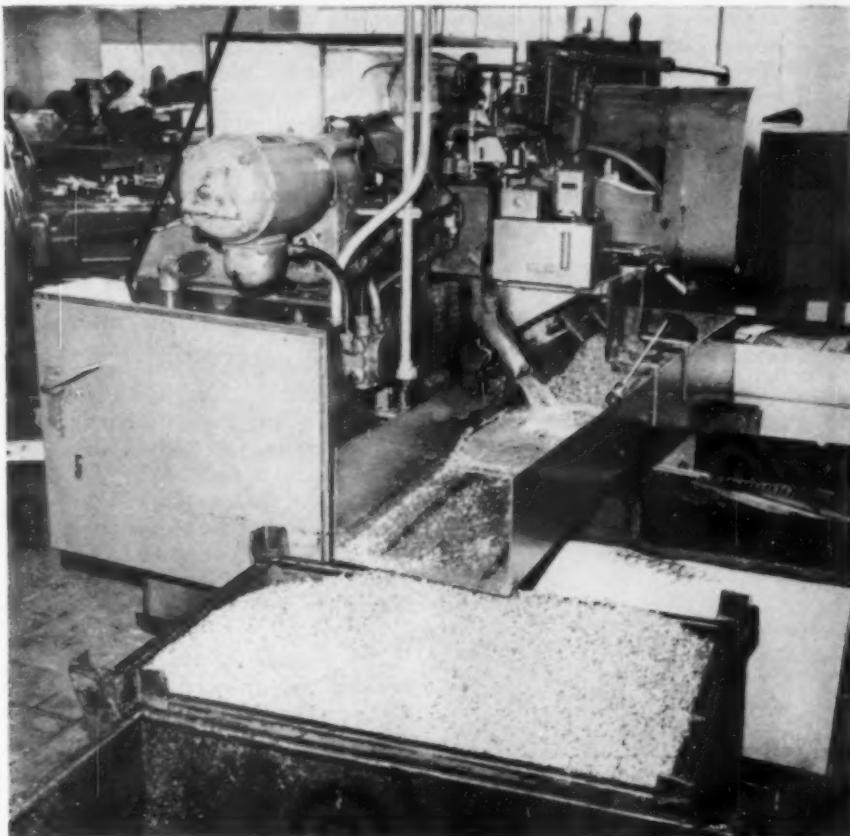
The machine operates continuously with all motions controlled by limit switches and relays, once the control "start" button is pressed. The mills are moved into the work at a controlled infeed of 24 ipm by means of Hause Holomatic units. The drill is moved into the work by a Bellows air cylinder.

All spindles are driven by electric motors. The milling cutters turn at

2200 sfpm, holding a finish below 32 rms. The cutters are made of high speed steel and are resharpened after 20,000 parts.

Large chips are carried off to a bin at the side of the machine through a horizontal sheet metal trough by occasional raking. The coolant is filtered of smaller particles by a Delpark system at floor level behind the machine. • • •

REAR VIEW of machine shows how parts, chips and coolant go their separate ways. Large quantity of chips indicates that this machine is kept quite busy.





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YOU DON'T REALLY NEED SO MANY PUNCHES!

Results of a survey reveal that certain sized punches appear in 8-out-of-10 cases

By **Harding R. Hugo**, Project Engineer
Dayton Perforators, Inc., Dayton, Ohio

■ "High limit sizing of open tolerance holes" has caused industry a lot of needless trouble and expense. Because of high limit sizing of open tolerance holes many different punches with special size points are used to make the same standard sized hole in a production part, even though that same hole appears again and again.

The primary consideration in the specification of a punch should be the function of the hole. The hole is the product. It either "fits something" or "clears something", and only one size is necessary for a particular hole to perform a particular function. The

1. Want to make a $\frac{1}{4}$ " hole? Any one of these twenty different point diameters can be specified for a plus-or-minus .005" tolerance.



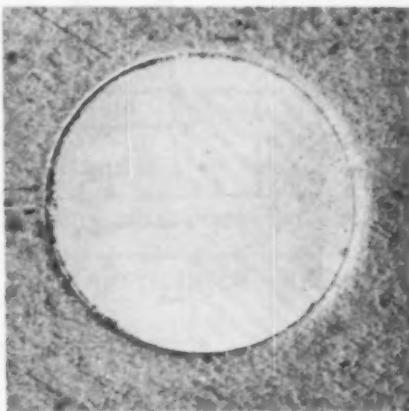
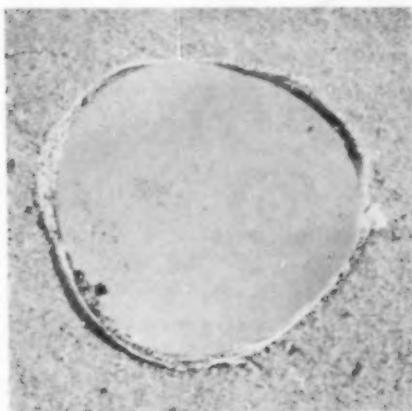
actual determination of function and specification of the hole is the responsibility of product design.

As an example of the use of several punch point sizes to make a hole take the case illustrated in Figure 1. Here, a part drawing calls for a $\frac{1}{4}$ " (.250") punched hole, plus-or-minus .005" to plus-or-minus .015". Because of clearance limitations between punch and die, tight hole size control is imperative, and as a result, die building precision must normally use punch size increments of .0005". Thus, within the greater limits established by product engineering, any one of 20 different point diameters can be specified for the plus-or-minus

.005" tolerance, and any one of 60 different diameters can be specified within the plus-or-minus .015" tolerance. Every one of those special point diameters can result in a production item which must be maintained... just to make a simple $\frac{1}{4}$ " hole.

But, you say, generous tolerances are necessary for wear allowance and to provide latitude in the economical application of the punch and die. This is pure fiction! It has been proved that wear allowance is not required! Actually, finished diameters of punched holes will vary from full point diameter (when punch is sharp), to not more than minus .001" when punches are very dull. Running with a dull punch does cause increased burr, part distortion and increased tonnage on the press—but, not reduced hole size! Figures 2, 3, and 4 illustrate what happens to a

Holes have a purpose—but only one size is needed



Much of industries' trouble lies in the attempt to apply drill sizes and specifications to punching applications. On the left, a drilled hole which is also an obviously out-of-round hole. On the right, a punched hole; round and on-size.

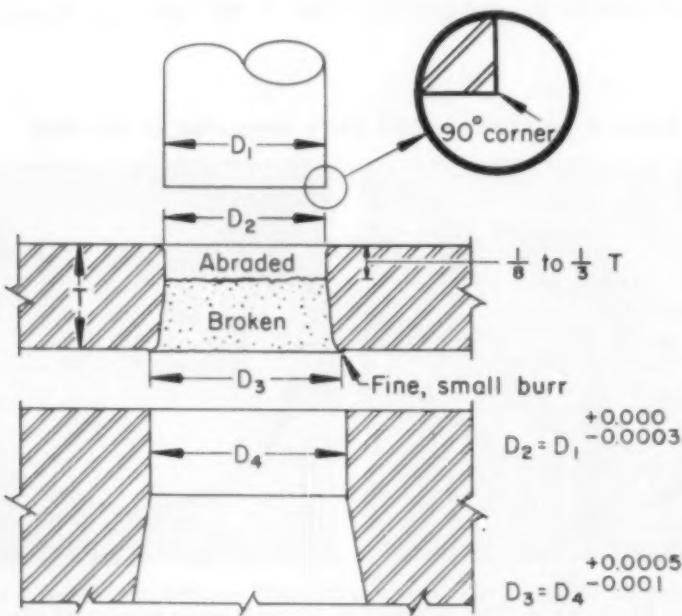
punch point when it becomes dull.

One of the most prevalent faulty bases for standardization adopted by product design groups has been the practice of attempting to apply drill sizes and specifications to punching applications. The trouble lies in the fact that a drilled hole is always larger than the drill size with which it was produced, larger by .002" to .005". What's more, drilled holes are usually drastically out-of-round.

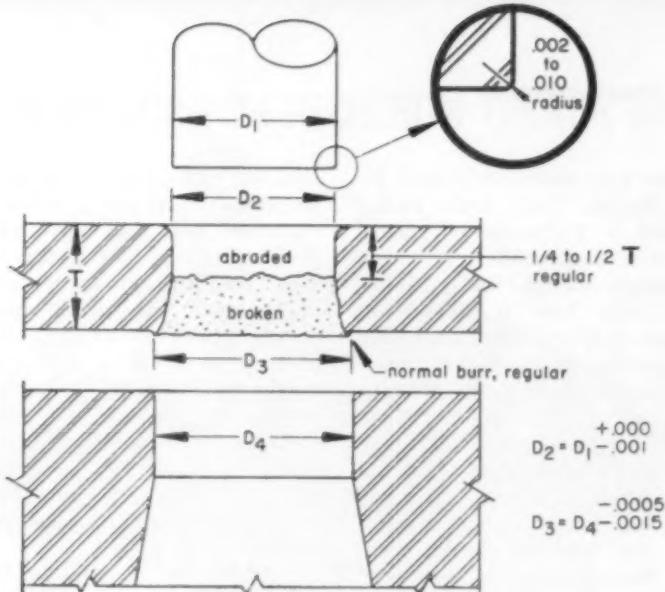
A punched hole, on the other hand, is always round and is usually .0005" smaller than the punch point di-

ameter. Thus, when using drill sizes and tolerances for specifying a punched hole, large, "open tolerances" result and that's where the confusion starts. Figure 1 illustrates what happens when open tolerances are applied to a simple quarter-inch diameter hole.

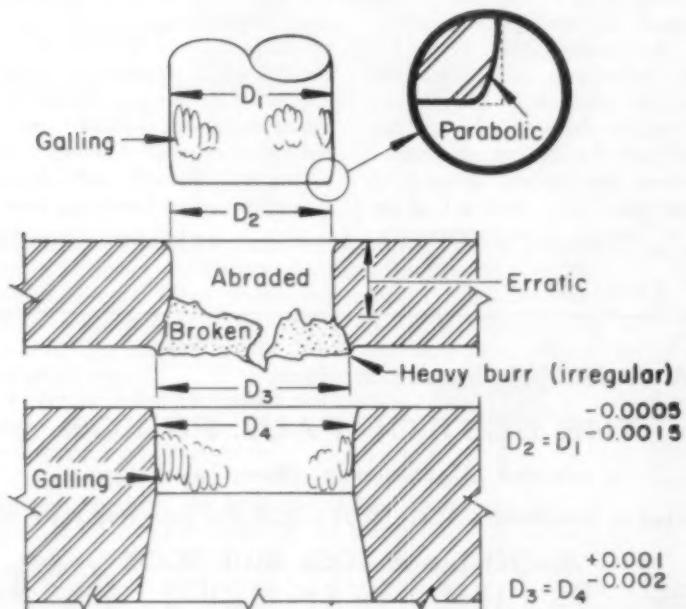
It is at this point that tool engineering has to make a choice of a specific punch size for the hole, and since their choice must be made arbitrarily without knowledge of the hole's function, without proper standardization as a guide, but somewhere



2. A SHARP, NEW PUNCH



3. SUITABLY SHARP PUNCH AND DIE



4. DULL PUNCH AND DIE

within the tolerances established by product design, "high limit sizing" occurs and a multitude of special punch point sizes result.

Surprisingly enough, the next time that particular hole is called for, another set of special sizes will probably be specified by another engineer.

Open tolerances are more than just false economy, they are a sheer extravagance! The price of a single punch is insignificant when compared to the compounding costs of stocking, special ordering, replacing and maintaining a multitude of special point punches. Providing those larger tolerances on the theory that it permits the tool engineer and die builder to supply punches at lowest cost is like being penny wise and pound foolish. Further, the total bill is run up because the exact size of a high-limit punch is not necessarily known and when it breaks, there may be nothing to do but pull the die out of production, remove the punch, mike it to find what size it is, then set about making or buying a replacement.

A study has been conducted which statistically analyzed punch usage and examined why they were used. The results revealed that certain standard sized punches appear in 8-out-of-10 applications, including holes for fasteners such as screws, rivets and eyelets; press or slip-fit rods and shafts; similar holes with plating allowances; clearances for protruding parts and even allowances for manufacturing tolerances that permit misalignment of mating parts. The moral is, you don't need all those punches!

For the first time in the industry, punches are now being mass produced at low cost and are stocked right on the shelf in the popular sizes based on proven usage. Thus, there is a common set of standards for product design, tool engineering and die building alike! It is up to these groups to effect maximum possible cost savings through reduced inventory requirements and through reduced machine downtime when breakage does occur.

• • •

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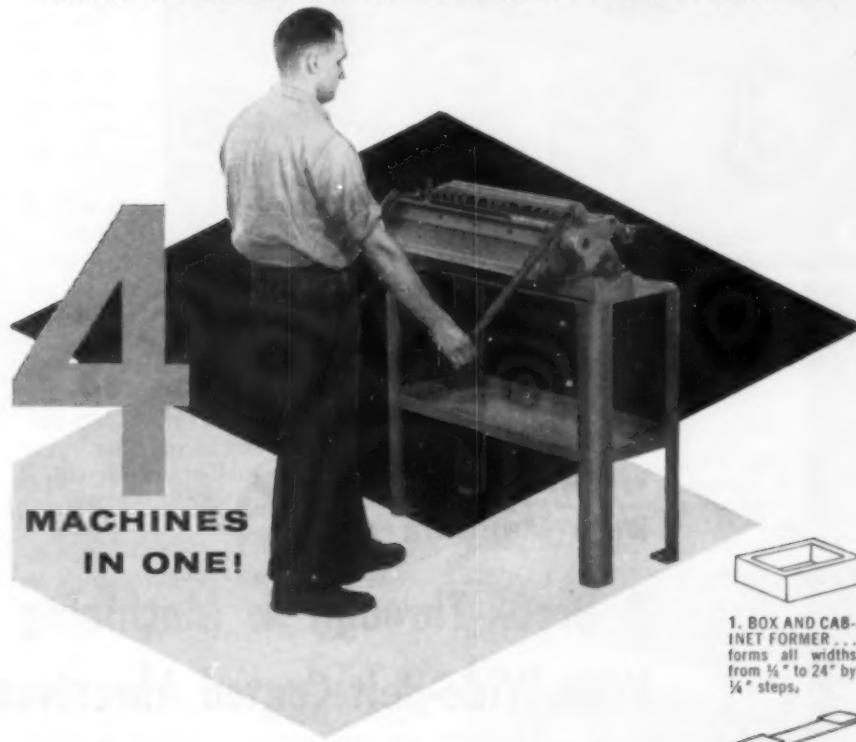
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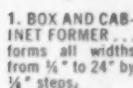


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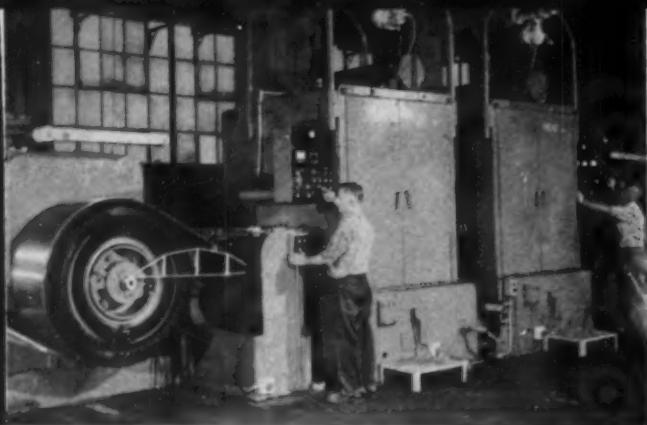
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Over-all view of new wide-belt oil grinding line. Protective paper is fed to the coil from the extreme left. Weight of a single coil often exceeds five tons. Filtration equipment occupies a room more than eight feet high under the machines.

Wallingford Steel and Behr-Manning reveal

A Break-Through In Machining With Wide-Belt Coated Abrasives

■ When Wallingford Steel Company recently revealed a new abrasive belt grinding line for producing "machined quality" stainless steel considerable excitement was generated throughout the stainless strip industry. For not only does the equipment solve the crown problem which long confronted fabricators, the new equipment saves nearly two-thirds of previous grinding costs!

Early estimates pointed to probable savings with the new line, in direct labor cost and that of abrasive belts alone, of nearly \$91,000 per year. It has already become clear that savings will exceed that rate. About 25 per cent of the plant's production will be ground on the new line; significantly, a 10-coil order can now be filled in 12 hours, instead of the 65 formerly required.

Another economy being realized with the new line is the

ability to salvage entire coils which formerly had to be shipped back to the mill for re-melting. Frequently, imperfections were too deep for the old dry grinding lines to handle—a condition most commonly met with the exotic metals such as titanium and zirconium, and with special alloys.

Holds Crown To Minimum

Thickness variations across the 28" width of the stainless strip can now be held to less than .0005". This is particularly significant to those industries that require exacting tolerances—aircraft, missiles, and space vehicles. The line is holding gauge tolerance and flatness never before possible in coiled strip up to 28" wide.

In addition to holding really close tolerances, the abrasive belt machines in tandem and grinding in oil are removing stock, doing corrective grinding, and producing superior finishes—all in a single pass. Finishes of 20 and 15 rms were reported in early tests on stainless strip and finishes as fine as 3-4 rms have been obtained.

Unlike earlier dry grinding equipment at Wallingford, the new machines use cloth belts, all-resin bonded, with aluminum oxide or silicon carbide abrasives. These belts grind in a flood of sulfur-chlorinated oil pumped into the grinding heads at up to 100 gallons per minute from a 5,000 gallon reservoir. When high polishes are required, less aggressive glue-bonded belts of cloth or paper will be used. Most of the time 60 and 80 grit sizes are used, though sizes 100 and up are used for some finishing operations.

The grinders were built by The Hill Acme Company according to designs modified by abrasive engineers of

Behr-Manning Company, a division of Norton Company, and by the abrasive engineers of Wallingford Steel. The grinders represent eight years of joint development work. They produce in one shift the stainless strip which formerly required three, while improving quality substantially.

Important Design Features

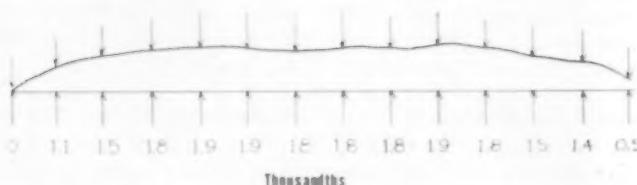
Several novel features combine to flatten the strip as it approaches the abrasive belt: the coil is under end-wise tension of 30,000 lb., and it is sharply bent, at angles up to 20°, by being forced under "break" rolls as it

Here's a 30" wide coated abrasive belt removing stock at a surface speed of 4200 sfpm, using a knurled steel contact roll. Oil floods each grinding head here at the rate of 65 gallons per minute.

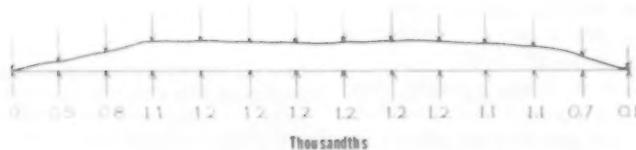


WIDE-BELT GRINDING continued

Before Grinding: (Hard temper)



After Grinding.



approaches and leaves the grinding point. Also, a solid steel billy roll or work-support roll 8" in diameter forces the strip against the belt by hydraulic pressure. With such heavy components, the machines can handle strip to .240" in thickness.

Contact rolls are knurled steel or serrated rubber, in a range from 45 to 90 Durometer, dynamically balanced. They operate at 900 and 1800 rpm to give belt speeds of 2100 or 4200 sfpm. Work is fed to the abrasive belts at speeds usually between 6 and 36 feet per minute, depending on the depth of cut, type of stock and the surface finish desired.

On tube-mill stock, for example, a typical sequence for adequate stock removal with the best finish and maxi-

mum production would use 90 Durometer serrated rubber contact rolls on both grinders, with land and groove width equal at $\frac{3}{8}$ " for maximum aggressiveness. With feed speeds of 18 to 20 fpm depending on the severity of imperfections, the first grinder would operate at 2100 sfpm belt speed, using a new 80-grit aluminum oxide belt; the second would run at 4200 sfpm. Each side of the strip would receive one pass.

A comparison of oil vs. dry grinding on tube-mill stock shows one pass as against three, one belt consumed instead of four and one-half belts, and 63 minutes required instead of 134. These processing times include coil handling.

The belt speed of 2100 sfpm is be-

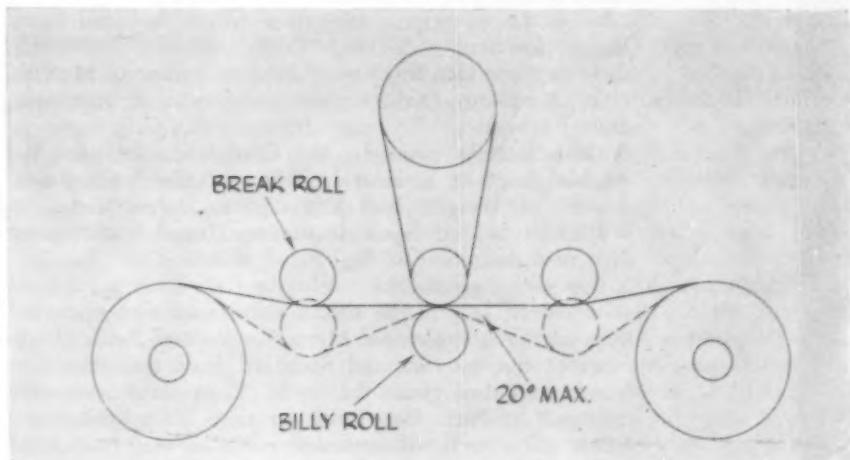
lieved to be the first time this lower speed has been used in abrasive belt grinding of this type. This speed selection has resulted from tests made by the Behr-Manning Product Engineering Department. The tests, which were made on the oil type grinding equipment at Wallingford, have proved that lower speeds with heavy oil flood increase belt life, increase stock removal and provide greater precision.

Significance With Impact!

Representatives of both Wallingford Steel Company and Behr-Manning are quite excited about the significance of this new abrasive belt grinding line. For not only does industry now have a means of producing stainless strip without a crown, the coated abrasive belt has finally received recognition as a basic industrial tool. • • •



A turn of two knobs reverses the direction of work (when multiple passes are required) and applies as much as 30,000 lbs. of tension to the strip. High tension is essential to precision grinding.



Break rolls flatten the strip as it approaches and leaves the grinding point, defeating the tendency of the strip to curl or bow. The contact roll (above the billy roll) may be of knurled steel for tolerance grinding or serrated rubber for stock removal and finishing.

At Paris . . .

World Formally Adopts New Standard Of Length

*A wavelength of light
replaces the meter bar*

PARIS, FRANCE: On October 14 the 11th General Conference on Weights and Measures adopted a new international standard of length—a wavelength of light—replacing the meter bar which has served as standard for over 70 years. This announcement was made from Paris by Dr. Allen V. Astin, Director of the National Bureau of Standards, U.S. Department of Commerce. Dr. Astin headed the American delegation which included Louis Polk, president, Sheffield Corp.; Elmer Hutchisson, director, American Institute of Physics, and A. C. McNish, chief, Metrology Division, National Bureau of Standards, among others.

Other actions taken by the Conference included the establishment of a central facility at the International Bureau of Weights and Measures for international co-ordination of radiation measurements and confirmation of a new definition of the second of time.

For many years, the world has relied on a material standard of length—the distance between two engraved lines on the International Meter Bar kept at Paris. Duplicates of the International Standard were maintained at laboratories throughout the world. These duplicates were returned to Paris from time to time for recalibration. Often there were discrepancies. The new definition of the meter relates it to a constant of nature, the wavelength of a specified kind of light, which is believed to be immutable and can be reproduced in any laboratory. The meter bars will still be used for certain types of

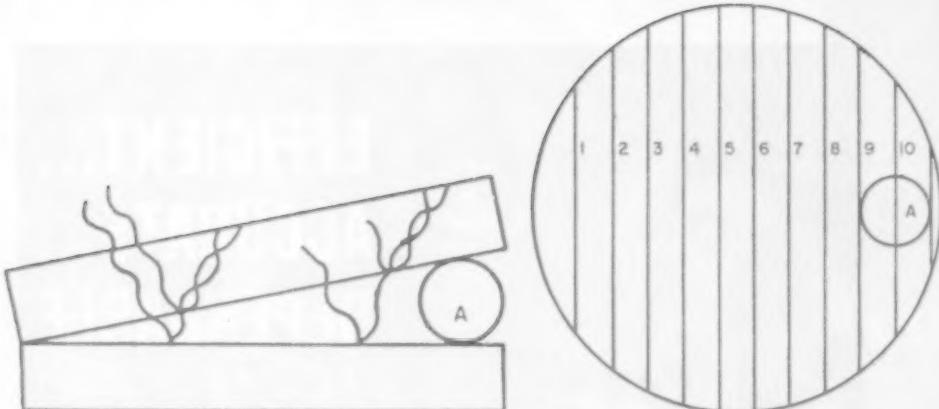


Figure 1 gives a side view of two flats being used to determine the height of object A. At those points where the reflected rays are out of phase by $\frac{1}{2}$ wavelength, dark bands appear in the upper flat. Figure 2 is a top view of the device, showing that 10-fringes appear between the two points of contact. If Kr-86 light is used, the height of the object is: $10/2 \times .0000238 = .000119"$.

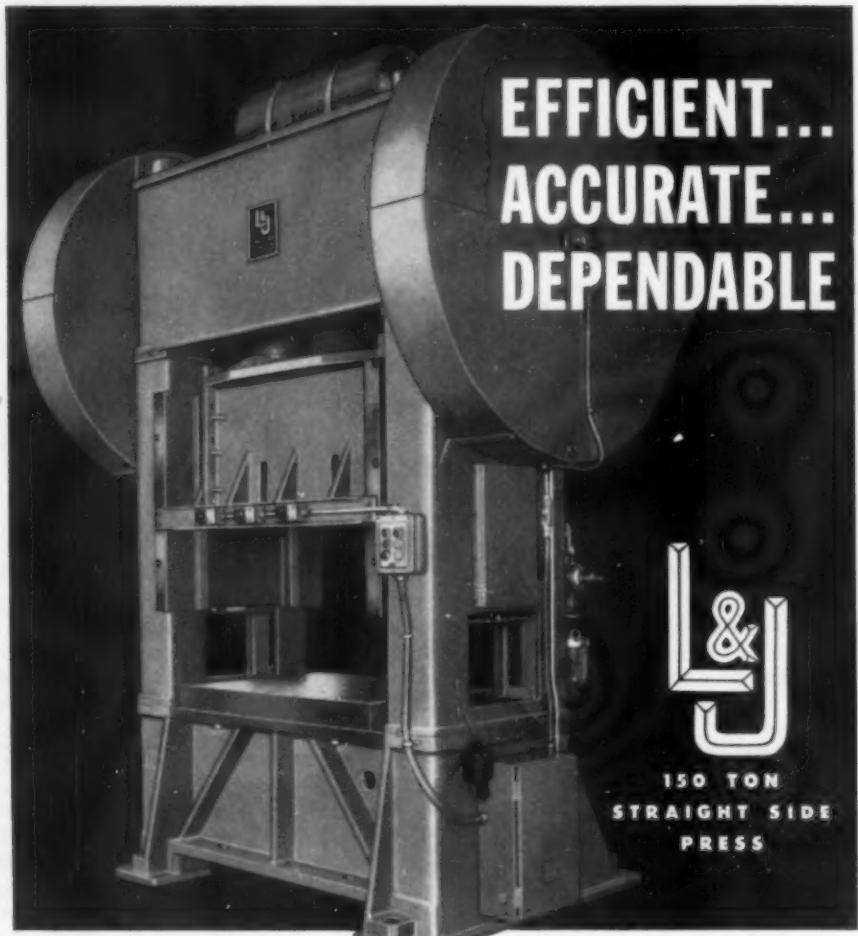
measurements. This new definition of the meter will not materially change the measurement of length nor in any way the relation between the English and Metric units. The inch now becomes equal to 41,929.389 wavelengths of the krypton light.

Measuring With Lightwaves

The question is—how can light waves, a form of energy, be used to measure length, a physical quantity? The interferometer is used to measure the meter by means of light waves. Krypton-86, the source of the new standard of length, emits an orange-colored light having 1,650,763.73 wavelengths to the meter. By means of optical instrumentation, this light is "laid" alongside the meter bar that has already been mechanically determined to an accuracy of less than one wavelength. Using an interferometer, one can then measure down to the fractional part of a wavelength by which the bar differs from the standard meter defined in krypton-86

wavelengths.

An example of a simple interferometer is that made with two optical flats—disks of glass or quartz whose facing surfaces are planar. These are positioned one on top of the other, making contact at one edge and separated at some other point by the object to be measured. Single-color (monochromatic) light is directed at the upper surface, and each ray is divided into two portions. One portion is reflected by the lower surface of the upper flat, and the other passes through to be reflected from the upper surface of the second flat. These rays are recombined in the upper flat, and form alternate dark and bright bands. Each dark band or fringe of this pattern represents a separation of the two flats by an even number of half wavelengths. By counting the number of fringes between the edge and point of contact with the sample, the height can be calculated—by multiplying the wavelength of light used by one-half the number of dark bands. • • •



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SPECIAL REPORT

Russians Come Up With Unique Micro-Feed Drive

Device utilizes change in length of a metal rod in a magnetic field

■ How accurately workpieces can be machined often depends on the precision with which the sliding members of a machine tool can be moved through very small distances. Lack of rigidity in the drive or unfavorable friction conditions may cause a slide to move irregularly, thus impairing workpiece accuracy.

In recent years, efforts have been made in several countries to increase the stability of slide movement in various ways, especially since the advent of program control, which can greatly facilitate the regulation of workpiece accuracy provided the machine tool responds exactly to the commands it receives.

Tests carried out in the laboratory of the Odessa Special Design Bureau, in Russia, show that a micro-feed device developed there successfully imparts small and accurate movements to a traveling member of a machine tool. The device makes use of the change in length of a metal rod along the axis of a magnetic field induced within it.

The Russian drive consists of a nickel rod set in the magnetic field of a coil. The left-hand end of the rod is free and the right-hand end is rigidly connected to the unit to be moved. Two clamps (one at the left, the other at the right) which close on the rod are attached to the frame of the machine.

At the start of the operating cycle, the left-hand clamp

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RUSSIAN DRIVE continued

is open, the right one is closed, and no current is flowing through the coil. When the current is switched on, the part of the rod between the clamps is magnetized, and the rod contracts in length since the left-hand end is free to move.

The left-hand clamp is now closed, the right-hand clamp opened, and current switched off. The rod immediately lengthens toward the unclamped end, so displacing the moving member of the machine tool. The minimum feed corresponds to the elongation of the rod during one magnetizing cycle.

Consecutive small movements can be imparted by the micro-feed drive during an automatic machining sequence. The total displacement can be within the limits of the free length of the rod. By using a conventional screw or rack, the sliding member can be set roughly in position before the micro-feed takes over. Automatic compensation can also be made for tool wear at fixed intervals. ★ ★ ★



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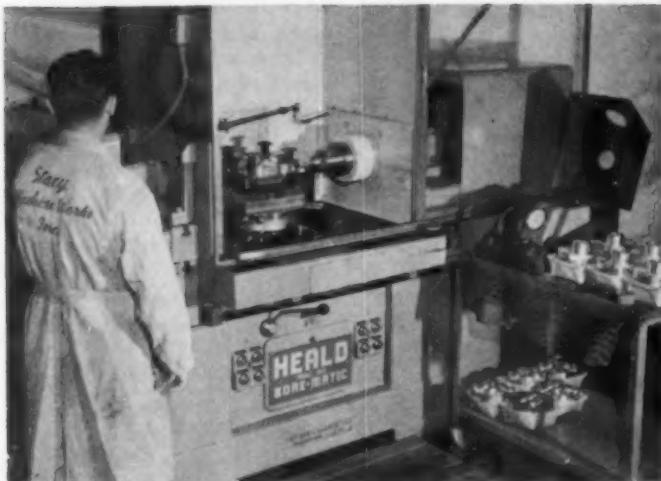
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field reports

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Operator checks setup for semi-finish and finish bore of four radial bores offset from centerline in Sparrow III missile hub assembly. Opposite bores must be in line within 0.002". Enclosure is provided since high pressure coolant stream is used, introduced through hollow spindle, to carry away chips during piston boring and insure the low microinch finish.

17 BORES HANDLED IN 5 SETUPS ON MISSILE HUB ASSEMBLY

■ Seventeen bores on the aluminum hub assembly of the Sparrow III missile are handled with only five setups on a double-end Heald 322 Bore-Matic at Stacy Machine Works, Agawam, Mass. A 5-8 microinch finish is achieved on the eight small piston bores that are part of the missile's fin guidance system, well within the specification of 16 microinch.

High pressure coolant fed through the hollow tool spindle to carry away chips was one trick used in the tooling to reach the smooth bore finish.

Parts were being delivered to Raytheon, prime contractor on the Sparrow III, within five months of the original order, with The Heald Machine Co. assisting in tool design.

The eight piston bores are bored and faced with one setup in a manual indexing fixture. Stock removal is 0.088" in diameter on the semi-finish bore and 0.033" on the finish. The Bore-Matic also plunges a groove at the bottom of the

FIELD REPORTS continued

bore as a relief and generates a smooth radius on the external edge in the same cycle.

Two other setups are required to make two in-line bores in the top cage and an additional pair at right angles to the first.

A fourth setup is used for semi-finish and finish boring of four equally spaced radial holes offset from the centerline by 0.026". The opposite bores must be in-line within 0.002". The hub assembly is mounted and cross slide indexed for the offset needed. The table moves left for the bore with tool dragline eliminated

by two-way boring. The work is indexed 90° and the next hole bored. After another 90° indexing, the cross slide is repositioned so that the offset will be in line with the opposite bores. The other two holes are bored in the same manner except the table moves right and the right hand head is used.

A fifth setup is used for through boring the center of the hub assembly.

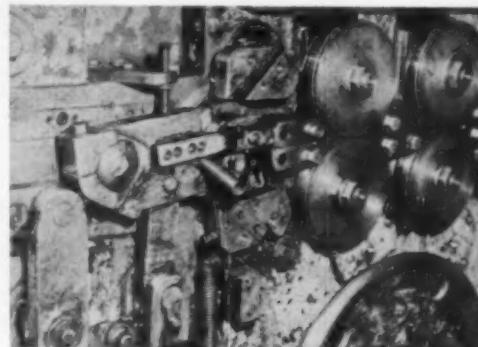
Production rates are not high with the manual clamping and indexing, but the eight piston bores and the center bore are handled in less than 20 minutes. Time on the two short counterbores including handling is 0.1 hour.

• • •

CARBIDE CUTOFF TOOLS SOLVE PROBLEM FOR COIL SPRING FIRM

■ The Technical Service Division of Adamas Carbide Corp. reports that the Illinois Coil Spring Co. of Chicago has licked one of their toughest spring cutting problems through the use of a special-purpose tungsten carbide die grade with a high percentage of cobalt. An increase from 3,000 springs per blank on the cut-off knife to 65,000 springs was achieved in the cutting of .172" dia. oil tempered wire; and an increase from 100 springs to 17,000 springs in the cutting of .156" dia. chrome silicon wire.

The report indicates that before switching to Adamas Grade HD-25-T, Illinois Coil Spring Co. experienced excessive downtime in wire cutting operations on their two Torrington Springmakers. The carbide blank previously used on the No. 3 Springmaker would chip badly and had to be replaced after cutting approximately 3,000 springs. No chipping or breakage, just slight wear, and not



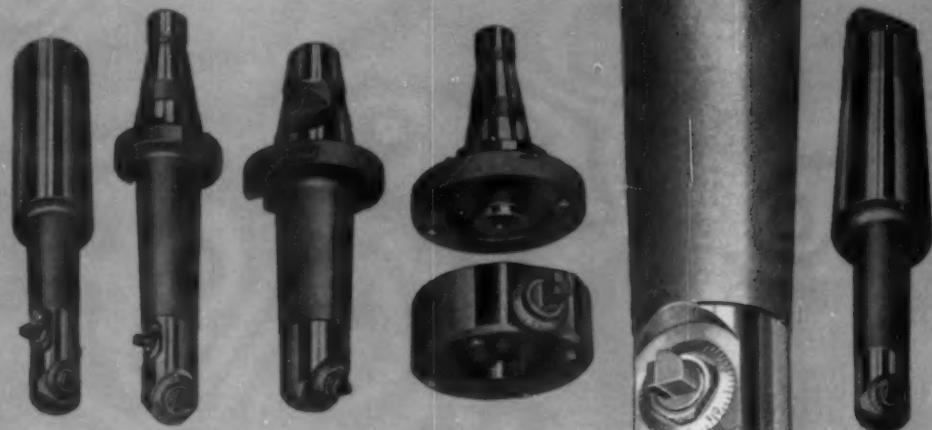
even enough wear to take the knife out for sharpening, was visible after using the Adamas No. 1490 blanks in Grade HD-25-T for 65,000 springs at a production rate of 800 springs per hour. One blank is used as a guide pad and another blank as a cut-off knife.

In the cutting of the chrome silicon .156" dia. wire on the No. 2 1/2 Torrington Springmaker, an Adamas

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FIELD REPORTS continued

No. 1360 blank, in the same HD-25-T grade, is used as a cut-off knife. Here, too, Illinois Coil Spring had tried a variety of other materials without success. Before switching to the tungsten carbide-high cobalt material, they made a maximum of 100 springs before the carbide blank on the cut-off knife cracked. With the

HD-25-T grade, wear and slight chipping became visible after 17,000 springs. Extended production time between knife sharpenings has also been achieved.

The high percentage of cobalt in Adamas Grade HD-25-T, along with the addition of tantalum, is responsible for the high impact strength and anti-galling properties of this material.

• • •



RESTORED LATHES BEAT SPECIAL TOOLING COST

■ Worn-out lathes with an individual value of under \$500 have been restored to a productive life as special, semi-automatic tracing lathes and have paid for their rejuvenation by eliminating a supplementary grinding operation.

To help one company beat the cost of special tooling, the Turchan Follower Machine Co. took two lathes ready for retirement and rebuilt them.

The two refurbished units now produce Diesel engine valves to a

finish of 12 microinches and tolerances of $\pm 0.0004"$. Cycle time for Stellite face valves, employing two "Throw-Away" carbide tip tools, is 45 seconds. Cycle time on valves without Stellite faces is 22 seconds. Each machine also handles a range of valve sizes, simply by changing tracer templates.

In rebuilding the units, Turchan re-scraped the ways and replaced the old gear box and lead screw with a Turchan Trace-Matic lathe attach-

ment. Finishes enabled by a constant feed rate feature are such that the necessity for valve grinding is eliminated; resultant savings have paid for the cost of revamping the machines.

In the lathe's new role, the operator manually loads a valve and presses the automatic cycle button. Traverse of the tool holder containing two tools causes the first tool to remove excess forging flash from the valve flange. Then, in one continuous motion, the second tool begins cutting



Finishes of 12 microinches and tolerances of $\pm 0.0004"$ eliminate grinding operations on Turchan Trace-Matic attachment on restored Diesel engine valves.

on the small diameter, follows up the radius and finally catches the valve face. The tool holder then retracts and the carriage returns to start position as the spindle is braked to stop. The collet opens, the operator unloads and re-loads for the next cycle.

Key to the success of the rebuilt lathes lies in the Trace-Matic attachment. This consists basically of a tracing valve, hydraulic cylinders for cross and longitudinal tool motion, hydraulic power unit, and control unit.

The lathes are now also adaptable to a variety of tracing assignments,

since the attachment will also trace 90° shoulders, opposing shoulders, tapers, radii, and other forms to tolerances of $\pm 0.0002"$.

Turchan has now established a separate lathe rebuilding and modification department, and, based upon early experience, expects a trend toward this technique of obtaining tracer machining benefits without excessive tool costs. • • •

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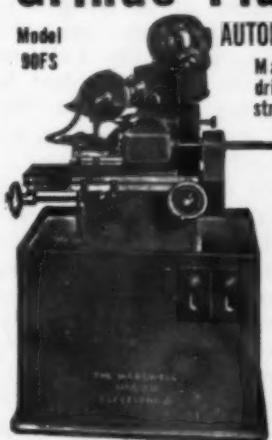
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CARBIDE INSERT THREADING TOOL CUTS TOOL MAINTENANCE COSTS

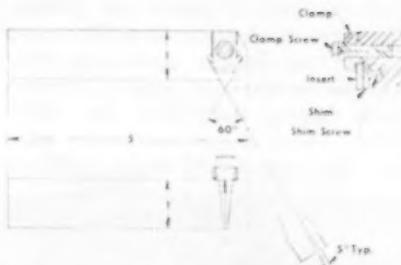
■ Specially designed threading tools with throw-away carbide inserts are reported to cut tool maintenance costs from \$10 to 15 cents for a number of missile parts that can be threaded by a single triangular insert.

The comparison is made between this tool and special brazed carbide tip threading tools, formerly used in Azusa, Calif., plant of Aerojet General Corp.

A 6.625" dia. 8NS-3A thread approximately 1 $\frac{3}{4}$ " long is machined on one end of the missile part. Parts are made of forged SAE 4130 steel, heat treated to 180,000-250,000 psi tensile strength. An offset type of tool is required in order to clear six brackets on the forgings.

Twelve pieces can be threaded by each insert, using three indexable cutting points on Grade K4H triangular Kendex inserts supplied by Kennametal Inc., Latrobe, Pa. The job is run at 110 rpm with eight passes of .008" infeed per pass. A feature of the tool is a special clamp that permits moving the insert forward until it is snug against the recess shoulders. Indexing can thus be done accurately on any tool pass without resetting stops. Total indexing and changing time for 12 pieces is 1 $\frac{1}{2}$ minutes at a cost of 15 cents.

The special brazed tip tools had to be ground after threading two forgings. Five-tool changes and five regrinds, required to thread 12 pieces, cost \$10. Differences in tool costs add to savings also.



This Kendex threading tool was specially designed by Kennametal Inc., Latrobe, Pa., for Aerojet General Corporation, Azusa, Calif., to replace a special brazed tip tool and eliminate the high costs of grinding and resetting tools. A tool feature is a clamp that permits moving the insert forward against recess shoulders for fast and accurate indexing of inserts without resetting stops.



Threading with a special Kendex throw-away insert tool that clears six brackets on a steel missile part eliminated grinding and resetting costs amounting to \$10 for 12 pieces when threaded with a brazed tip tool.

The machining operation is done on a 2A Warner & Swasey machine of 30 hp, using a full flow soluble oil coolant.

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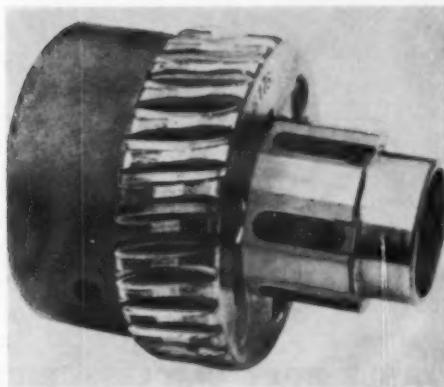
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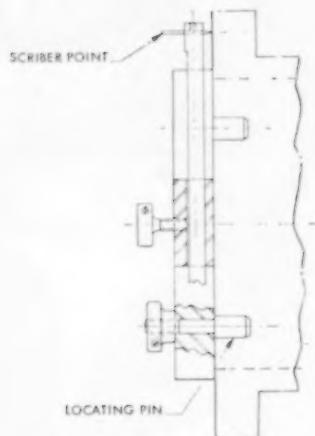
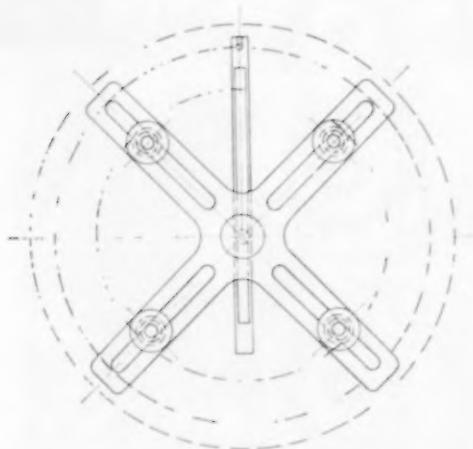
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WHERE WEAR IS A PROBLEM, FACE WITH CARBIDE

■ Maintenance of an automatic screw machine clutch, and machine down-time, were reduced to one-eighth at the end of 30 months of continuous operation by use of six tungsten carbide inserts in the roll clutch cam section. In a test application of carbide inserts the manufacturer of the machine replaced inserts made of carburized case-hardened steel with a Kennametal hard carbide alloy made by Kennametal Inc., Latrobe, Pa.

The high impacts and rate of wear had required replacements of steel inserts every three and a half months, each taking four to five hours of machine down-time and labor. The carbide inserts, still in use after eliminating down-time eight times, have been made standard parts of these clutches on other machines. • • •



ADJUSTABLE BOLT CIRCLE SCRIBER

By Roger Isetts

Often when making short run production or experimental parts, bolt circles on castings, flanges, etc., have to be laid out. This can become quite an expensive time consuming procedure even if the quantity of pieces to be made is relatively small.

Illustrated is a simply constructed adjustable scriber that will greatly speed up such work. A mild steel plate is sawed out in the shape of a cross forming four equally spaced arms. Four slots are milled lengthwise in each of the arms. Four locating pins made from drill rod are turned down to a shoulder—the shank diameter being a good fit in the milled slots. Then a thread is cut on the ends of the pins to receive knurled thumb nuts.

A cross hole is reamed lengthwise through the center hub of the cross for the shank of the scriber. A hole is tapped in the center for a thumbscrew that serves to clamp the scriber shank in place. The scriber itself is merely a round piece of cold rolled steel with a flat milled for clamping. A small hole is drilled for the scribe point, which can be a phonograph needle or a compass point. A small hole is tapped in the end for a set screw used to clamp the scribe point, making it a simple matter to replace the points when they become dull.

In use, the locating pins are adjusted to fit either the bore or o.d. of the part. The scriber is adjusted out to the desired bolt circle and clamped.

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AIR GAGE LENDS EXTRA ACCURACY TO DRILLING

■ Mechanical Products Corp. of Chicago has found a way to assure needle-point precision on an extremely critical drilling operation. The drilling occurs in the manufacture of a liquid metering pump which dispenses beverage concentrates, chocolate, etc. Extremely close tolerances made conventional drilling impractical so the company attached an Ames AG5 Accu-Flow air gage, which is adaptable to any tolerance to millionths of an inch.

By setting the AG5's depth indicator to the precise measurement required, the drilling machine operator can watch the indicator needle and tell exactly when the proper hole depth



has been reached. He then withdraws the drill and proceeds to the next position. With simple fixtures, the air gage can be used for a variety of continuous non-contact measuring or comparing applications. It can also be used as a depth, hole or grinding gage.

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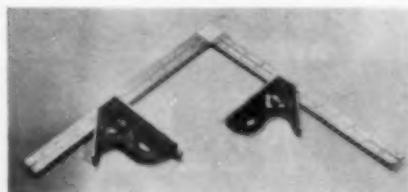
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BOX GAUGE

By Robert Micals

■ To simplify checking the squareness, length and width of sheetmetal electrical boxes as they are being formed on a brake, we use a gauge made of two combination squares brazed at right angles with a 1" x 1" filler.

• • •



MACHINE and TOOL BLUE BOOK

free literature

To receive copies of booklets described below, circle their identifying numbers on an Action Card, found opposite pages 56 and 218.

15



(See Number 1)



(See Number 2)



(See Number 3)

1. Wiring Installation Equipment. 16-page Catalog No. 159-D covers Keystone JIC and NEMA Type 12 wiring installation equipment. This includes the complete line of wireways, fittings, and enclosures manufactured to meet JIC and NEMA Standards. A wide variety of liquid-tight units are included for applications where wiring must be protected against dust, dirt, oil, etc. Keystone Manufacturing Co., 23328 Sherwood Rd., Warren, Mich.

2. Marking Machines and Accessories. The complete Noble-West line is contained in a recently-published catalog, designed to serve as a comprehensive guide to selection of basic marking machines and related accessories. The catalog is sectionalized for quick reference on roll marking, press stamping, hand stamping, graduating, marking dies, and tools. Noble & Westbrook Manufacturing Co., E. Hartford, Conn.

3. Industrial Power Systems. "Better Power for Production" outlines principles of planning industrial power distribution systems for safety, reliability, and economy while retaining flexibility and provision for future expansion. Chapters include choosing voltages, short circuit calculations, protective relaying, selection of unit substations, power factor corrections, and grounding. Bulletin GEA-7139 from General Electric, Schenectady 5.

4. Bar Feed Attachments for the manufacturers' horizontal metal cutting band saws are described in flyer. The three units—Models BF-24, BF-20, and BF-14—are automatic and completely self-contained. W. F. Wells & Sons, Inc., Three Rivers, Mich.

5. Diamond Wheels. Diamond Tool Research Co., Inc., 380 Second Ave., New York 10, has published a larger and more extensive catalog with pricing system covering diamond wheels, hones, and mandrels. For all wheels where natural diamonds are requested, DTR will use their Pressure-Tested diamond grits at no added cost to the user. For synthetic or man-made diamond wheels, newly developed bonds are featured.

6. Turret Lathe. The Sheldon 3R turret lathe, equipped for turning, chucking, and single point threading, in addition to standard turret operations, is described in four-page bulletin from Sheldon Machine Co. Inc., 4258 N. Knox Ave., Chicago 41, Ill.

7. Hack Sawing Machine. Brochure introduces the new Elliott-Velox 6" high speed hacksawing machine added to the Elliott-Velox hacksaw range. Velox saws are now offered in four capacities—6", 7½", 10", and 12". Elliott Machine Tools, Div. B. Elliott (Canada) Ltd., Port Hope, Ont.

FREE LITERATURE continued

8. Hand Feed Surface Grinder. King Model K-1020 is described as a large-capacity grinder—longitudinal travel is 20", cross feed 14", vertical standard 15" under 12" wheel. Work table surface is 10" x 20" as wet grinder, or 12" x 20" as dry grinder. Design features are emphasized in brochure from King Machine & Mfg. Co., 1171 E. 32d St., Los Angeles 11.

9. Cam Presses, for assembling, staking, punching, forming, sizing, and riveting, are described and illustrated in pocket-size folder available. Whitney Metal Tool Co., 702-724 Forbes St., Rockford, Ill.

10. Drill Jig Bushings. Bulletin 1106 comprises technical data, specifications, and price list on Ace's drill jig bushings. There is a section on conversion tables which includes new ASA and ACE symbols with ABC, ACME, COL., ECON., XLO, and UNIV.—symbols of other leading manufacturers—shown for comparison. Related products are also described. Ace Drill Bushings, 5407 Fountain, L.A. 29.

11. Manufacturers' Exchange Service is discussed in brochure as to advantages, services, and terms. Many manufacturers often find themselves with component parts or products not required. The recently organized Manufacturers' Exchange Corp. provides a listing service to bring together these potential buyers and sellers. Manufacturers' Exchange Corp., Peoples State Bank Bldg., Holland, Mich.

12. Engine Lathe. 12-page bulletin covers the firm's new Model 4025 extra heavy duty engine lathe. Fully illustrated, the catalog features complete product information and specifications. Sidney Machine Tool Co., Sidney, Ohio.

13. Railroad Repair Shop Tools. Mailing piece briefly describes the fully automatic undercutter and banding machine, included in the Peerless line of seasoning and grinding machines, coil end brazing machines, armature winding stands, traction motor upenders, and motor frame stands. Peerless Tool Div., Mummert-Dixon Co., Hanover, Pa.

14. Optical Comparators and Measuring Machines. Individual brochures detail latest designs on the J&L 14" and 30" screen models, and the new 10" screen, economy sized optical comparator and measuring machine. Jones & Lamson Machine Co., Springfield, Vt.

15. Milling Machines. 40-page Bulletin No. S-60 illustrates and describes Kearney & Trecker's newest addition to their knee type line of milling machines, the S Series. Presented are the plain, universal, and vertical styles, in two sizes, No. 2 and No. 3. Ram head models are also available in the same sizes and are described in brochure No. RS-60. Kearney & Trecker Corp., Milwaukee 14, Wis.

16. Mounts. New Serva-Levl Mount, Series AM, is designed to support loads up to 30,000 lb. per mount. Equipment that can be supported is listed. Flyer from Barry Wright Corp., Watertown 72, Mass.

17. Roll Grinding Wheels. Literature describes the desired wheel characteristics required for all types of modern roll grinding as well as including case histories and roll grinding wheel recommendations. Macklin Co., Jackson, Mich.



(See Number 10)



(See Number 11)



(See Number 12)

18. Broaching Machines. Sundstrand-American four-way convertible broaching machines have the advantage of a basic vertical design that can be arranged for or converted to operations such as push down, surface, pull down, or pull up. Models are from 5 to 50 ton cap., 30° to 90° strokes. Sundstrand Machine Tool, Div. of Sundstrand Corp., Belvidere, Ill.

19. Spiral Spacer. Form 8-659 describes the Huck universal-type spiral spacer for use when joining crushable panels to other parts or panels. Huck Mfg. Co., 2480 Bellevue Ave., Detroit 7, Mich.

20. Shapers. Many outstanding design features are presented on the heavy-duty 8" stroke Shape-Rite shaper in brochure from Havar Mfg. Co., Minneapolis 4.

21. Jig Borer. The new Moore Model No. 1½ jig borer, combining features of the No. 1 and No. 3 models, and incorporating a new, special three-position clutch, is described in brochure, with specifications and performance data. Moore Special Tool Co., Inc., Bridgeport 7, Conn.

22. Ram-Type Milling Machines. Various models are illustrated, diagrammed, and described in recent literature. Some of the important features emphasized are a fully 90° adjustable cutterhead and convenient controls. Van Norman Machine Co., Div. Van Norman Industries, Inc., Springfield 7, Mass.

23. Machine Tools. Catalog 318 explains the important features that have been added to the No. 1 precision surface grinder, the 6" rotary grinder, the 24" semi-automatic lapping machine, the 24"

rotary lapping machine, and the Taft-Peirce back spot facing machine. Taft-Peirce Mfg. Co., Woonsocket, R.I.

24. Special and Standard Tap catalog features price lists for special and standard taps together with technical information. Regal Div., Beloit Tool Corp., Beloit, Wis.

25. Feed Tables and Machine Beds receive primary attention in Catalog 260, which includes design features, ordering data, and power drives for feed tables. Other Master machine tools presented include a portable ram-type milling machine, and machining heads. Master Mfg. Co., Inc., Hutchinson, Kansas.

26. "Tooling Information Service" is a monthly magazine published by the Detroit Tooling Association, (formerly the Automotive Tool & Die Manufacturers Association). It is available free to anyone interested in dies, jigs, fixtures, molds, gages, tools, special machinery, and related products, as well as die tryout, machining, experimental, and designing services. Detroit Tooling Assn., 103 Pallister Ave., Detroit 2, Mich.

27. Shapers. Design features, table types, attachments, and specifications are provided for the Smith & Mills shapers. Standard duty machines are available in 20" and 24" strokes; heavy duty models in 16", 20", 25", 28", 32", and 36" strokes. Smith & Mills Shaper Div., Nebel Machine Tool Corp., Cincinnati 25, Ohio.

28. Hydraulic Way Type Feed Units. Four-page brochure details a new concept in these units, with four sizes offered. Buhr Machine Tool Co., Ann Arbor, Mich.



(See Number 22)



(See Number 23)



(See Number 24)

FREE LITERATURE continued

29. Flying Cut-Off Presses. Eight-page bulletin helps evaluate the merits of a power press, designed for cutting off roll-formed shapes on the fly. It aids in selecting correct press for the job. Press speeds and accuracy also are covered. Federal Press Co., 841 Division St., Elkhart, Ind.

30. Metal Stamping Equipment, as presented in 42-page Catalog NA100, includes single wheel hand stamping, multi-wheel numbering machines; automatic numbering heads, presses, etc. Numberall Stamp and Tool Co., Staten Island 12, N.Y.

31. Press Brakes. Construction features are described and general specifications are given on the Chicago straight-side-type press brakes in Bulletin No. SS-60. Dreis & Krump Mfg. Co., 7400 S. Loomis Blvd., Chicago 36, Ill.

32. Component Parts For Jigs & Fixtures. Catalog No. 31 includes full scale tracing templates of Northwestern jig and fixture components and over 300 clamping items. Addresses of 64 distributors in the U.S. and Canada are included. Northwestern Tools, Inc., Dayton 1.

33. Turret Lathe. The newly designed Gisholt Masterline AR turret lathe is described in catalog as combining the efficiency, speed and consistent accuracy of an automatic with the fast setup and versatility of its counterpart, the hand-operated ram type turret lathe. It handles bar and chucking work. Gisholt Machine Co., Madison 10, Wis.

34. Vertical Machine For Grinding, con-

touring, turning, and boring are described in Bulletin No. 560. Included are four standard series and production or specialized custom machines to meet individual needs, with swing up to 178" or more. Frauenthal Div., The Kaydon Engineering Corp., Muskegon, Mich.

35. Filters, Regulators, Lubricators. Crown Line Bulletin 0400-B1 provides complete catalog listings as well as simplified engineering and application data on Crown filters, regulators, and lubricators. Hanifin Co., Dept. 130, Des Plaines, Ill.

36. Shaper & Hobbing Machine. Two illustrated brochures—one on the Fellows 3" fine-pitch gear shaper and the other on the Fellows-Pfauter P400 high-speed hobbing machine—are offered by The Fellows Gear Shaper Co., Springfield, Vt.

37. Die Casting Machines. 12-page bulletin describes complete line of Cleveland high pressure hydraulic die casting machines—100, 250, 400, 650, 850, 1000, and 2000 ton models. The Cleveland Automatic Machine Co., Cincinnati 12.

38. Magnetic Coolant Separators. Catalog No. 300-D gives detailed information on these Barnesdrill units. Various models will clean dirty coolant in flows ranging from $\frac{1}{2}$ to 120 gpm. Barnes Drill Co., 852 Chestnut St., Rockford, Ill.

39. Surface Plates. A new brochure, containing technical answers to questions about granite surface plates, is announced by Rahn Granite Surface Plate Co., 641 N. Western Ave., Dayton 7, Ohio.

40. Gear Inspection Machines. Catalog C60-8 describes and illustrates such Red Ring models as Model GRF automatic



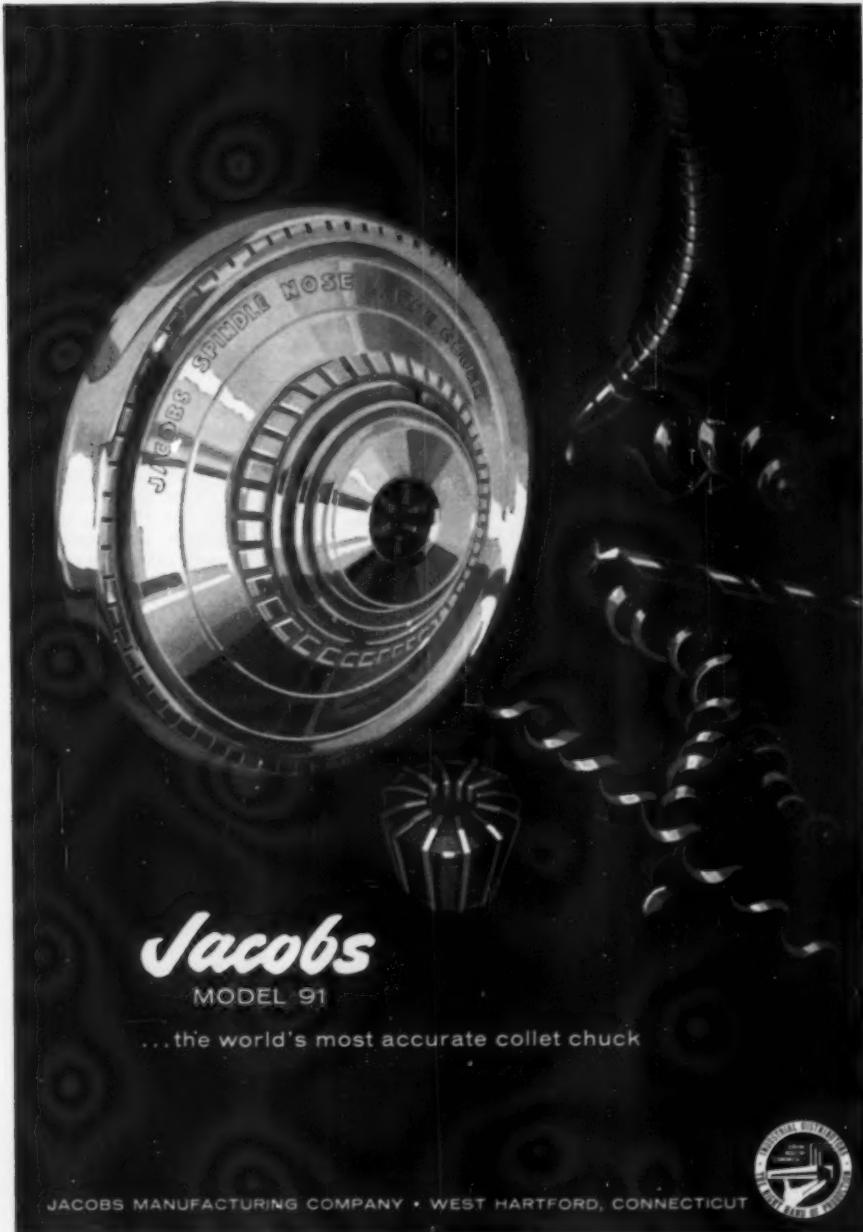
(See Number 32)



(See Number 33)



(See Number 34)



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FREE LITERATURE continued

gear checkers and classifiers, Models GRJ and GRH simplified gear rolling fixtures, Model GSC gear speeders, and an involute checker. National Broach and Machine Co., Detroit 13, Mich.

41. Vises. Catalog 115 presents industrial vises such as combination pipe and bench, machinists', swivel jaw, drill press, and milling machine. Other products, listed with specifications and prices also, include commercial vises, C-clamps, PowR-arm work positioners, and power tools. Wilton Tool Mfg. Co., Schiller Park, Ill.

42. Precision End Cutting Tools offered in catalog include carbide tipped expansion reamers, solid reamers, counterbores, end mills, core drills, and spotfacing, standard and special. Specification listings include dimensions and prices. Prices are included for regrinding stock reamers. Carr Tool Co., 3810 Hires Lane, Cincinnati 12, Ohio.

43. Mounting Accessories. Catalog M contains the applications for and the complete line of mounting accessories available for use with Unipunch Hole Punching and Notching Units. Punch Products Corp., Buffalo 6, N.Y.

44. Automatic Tracer-Controlled Miller, the Keller BL-3622 Model C, is presented in brochure. Operational features stressed include high speed milling, heavy-duty cuts, and superior surface finishes. Structural features include a new electronic control, interchangeable tracers of three types, and centralized operator's controls. Pratt & Whitney Co. Inc., W. Hartford.

45. Oscillating Belt Grinders. The Tri-Matic, in 12" through 48" sizes, is described in brochure. Specifications and typical applications are given, plus the Tri-Matic oscillating sheet surfer using abrasive impregnated nylon. Sales Service Mfg. Co., 2363 University Ave., St. Paul.

46. Mechanical Power Transmission equipment described and illustrated in Catalog 23103 includes variable speed drives and V-belt drives; pulleys; couplings; pillow blocks; bushings, etc. T. B. Wood's Sons Co., Chambersburg, Pa.

47. Shapers. The new Series 3000 Shear-Speed shapers for rapid cutting of gears and other external forms are presented in Bulletin No. 3000-60. Model 3053 cuts parts 1" to 5" in dia. and Model 3073 cuts parts 3" to 7" in dia. Michigan Tool Co., Detroit 12, Mich.

48. Precision Milling & Boring Machines, Scharmann Models FB300 and FB315, offer the advantages of round column grinding of the headstock. Important features are illustrated and complete specifications provided in folder available from Scharmann Machine Corp., 337 Boulevard of the Allies, Pittsburgh 22.

49. Machine Tool & Industrial Hydraulics, their application and recommendations, is the subject of Catalog EJS from the John S. Barnes Corp., 315 S. Madison St., Rockford, Ill.

50. Dust Control. Discussing the four main types of dust control products—dry centrifugals, wet collectors, fabric collectors, and electrostatic precipitators—Bulletin No. 271 describes 13 different AAF products. Dept. PD, American Air Filter Co., Inc., Louisville 8, Ky.



(See Number 42)



(See Number 43)



(See Number 44)

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MICRO-DRILLING MACHINE

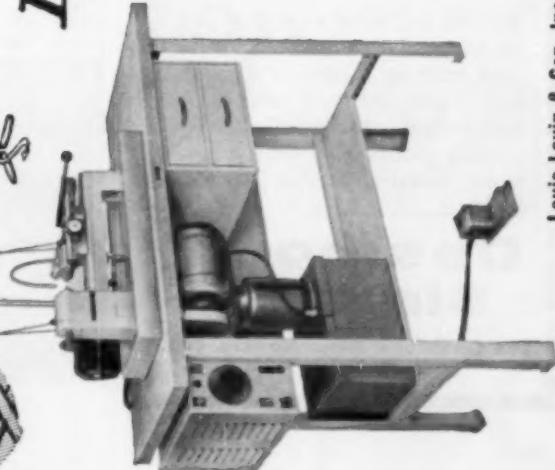
Designed for the most precise drilling of small holes. The drilling spindle, as well as the head stock spindle, revolves and thus the maximum straightness and concentricity are assured. The feed is so arranged that it does not depend on the operator's sense of feel and the smallest drills may be safely used.



For full details of Drilling Machine and Instrument Lathes send for catalog T.

* Smallest commercial drill available.

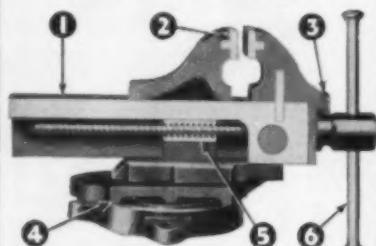
Louis Levin & Son, Inc., 3573 Hayden Ave., Culver City, Calif.



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VICE FEATURES

1. exclusive steel slide milled from solid bar
2. replaceable jaw inserts held by top-entering pins
3. outside screw retainer



4. positive locking 360° swivel base
5. longest wearing alloy steel nut
6. one-piece non-pinch handle

SOLID STEEL SLIDE

Simplex industrial vises give you the advantage of solid steel slides, jaws, nuts for maximum strength and ruggedness long after their modest cost is written off. Line includes milling machine, pipe, sheet metal and other models.

Desmond Simplex

The Desmond-Stephan Mfg. Co.
Urbana, Ohio

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FREE LITERATURE continued

51. Turret Lathes. Three new J & L turret lathes are described in separate brochures—one is a new ram type turret lathe with multi-speed hydraulic headstock; another is a saddle type turret lathe with multi-speed headstock, and the third is an entirely new automatic turret lathe featuring complete programming of all machine functions from a single staging panel mounted on the machine. Jones & Lamson Machine Co., Springfield, Vt.

52. Selector For Speed Reducers. As an aid to designers, engineers, and others seeking the right model Radicon fan-cooled worm gear reducer, this new free "Quick-Selector" guide is offered by Foote Bros. Gear and Machine Corp., 4545 S. Western Blvd., Chicago 9.

53. P.D.Q. Tool Line. Brochure illustrates the Portage Double Quick line of tools, as well as the Portage Machine Co.'s line of horizontal milling, drilling and boring machines. Portage Double Quick, Inc., Akron 14, Ohio.

54. Numerically Controlled Machine Tools. Drilling, tapping, reaming, boring, milling (straight-line) are fully programmed on one Hillyer machine. There are six different models of single spindle machines and four different models of the turret machines. Complete information, with optional equipment and accessories, is given in folder from Hillyer Corp., 331 Centennial Ave., Cranford, N.J.

55. Diamond Wheel & Tool Catalog, No. 720, lists metal and resin bonded diamond wheels, diamond hones, mounted points, diamond dressers, diamond saws, and diamond core drills. Listed are standard types of wheels, in either man-made or natural diamonds. Special types or shapes can be provided. Delta Diamond



(See Number 52)

MACHINE and TOOL BLUE BOOK

Wheel Corp., 1403 Utica Ave., Brooklyn 3, N.Y.

56. Bar & Chucking Automatics. Bulletin CA-60 shows how the capabilities of Acme-Gridley multiple spindle bar and chucking automatics permit performing a wide range of machining operations. The National Acme Co., 170 E. 131st St., Cleveland 8, Ohio.

57. Tool Steel Catalog. Darwin & Milner, Inc., 2222 Lakeside Ave., Cleveland 14, has completed a new 144-page catalog of their complete tool-steel line. It features an up-to-date selector for the 24 varieties supplied. Several new tool-steel types are described. Letterhead inquiries only accepted.

58. Furnaces. Brochure illustrates and describes four of Sunbeam's processing furnaces—Box Recirculator, Pit Recirculator, Shuffle Hearth, and Casemaster. Sunbeam Equipment Corp., Meadville, Pa.

59. Gun Drillers & Drill Speeders. Bulletin gives turret dimensions for all Warner & Swasey, Jones & Lamson, Gisholt, and Bardons & Oliver models of turret lathes. Correct model gun driller or drill speeder can then be selected from the tables. The Ward-Riddle Co., Ravenna, Ohio.

60. All-Steel Press Brakes. Brochure introduces the 35-45-55-65 Series, featuring two-speed gearing, with capacities at either 40 or 20 spm. Specifications cover this series, as well as the 90-120-150-200 Series. A brake bending chart and a punching chart are included for the press brakes, which run from 30 through 200 capacities. Excelsior Tool & Machine Co., 31st & Ridge Ave., E. St. Louis, Ill.



(See Number 57)

Motch & Merryweather will send a sharp engineer



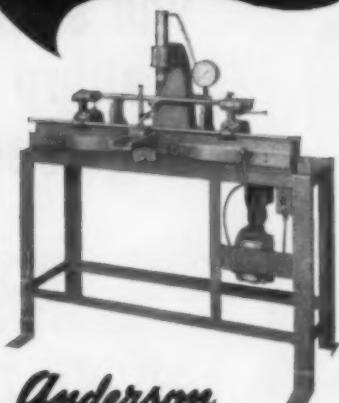
. . . A sawing specialist, that is, who can show you how to get the most out of your sawing and sharpening equipment. When you select Motch & Merryweather saw blades you get top quality and top service. Call your M&M distributor.



Cutting Tool
Manufacturing Division
Cleveland 17, Ohio

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Fast...Accurate STRAIGHTENING



Anderson POWER PRESSES

Increases Plant Production

Anderson power presses have solved the problem of manufacturers with straightening, checking, and truing operations that require more than ordinary speed and accuracy.

One plant, for example, showed an increase from (6 to 10) to (30 to 40) by using the Anderson Model HP-004 P 4 ton press shown above.

The full range of Anderson presses (4 to 50 tons) will help you profit from low-cost, high production precision straightening.

Write for Bulletin 11-22



ANDERSON BROS.
MFG. CO.
Rockford, Ill.

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FREE LITERATURE continued

61. Flame Hardening. Clearly illustrated and diagrammed, 12-page brochure discusses the various problems of oxyacetylene flame hardening, and shows how these problems can be solved with Airco equipment. Air Reduction Sales Co., 150 E. 42d St., New York 17, N.Y.

62. Pneumatic Clutch and Brake. Bulletin No. 52100 describes the Warco unit which is used as replacement equipment on all makes of presses. The Federal Machine & Welder Co., Warren, Ohio.



(See Number 63)



(See Number 64)

63. Air Tools. The complete line of Aro air tools, power motors, and accessories, including a number of recently-introduced products, is described in detail in 96-page Catalog No. 64. Industrial Div., Aro Equipment Corp., Bryan, Ohio.

64. Punches & Dies. 48-page catalog shows the greatly expanded Ring line which now includes regular, medium, and long lengths in Ring and head-type punches, a complete range of press-fit and head-type stripper bushings, and quill punches in three sizes. Ring Punch & Die Div., The Producto Machine Co., Jamestown, N.Y.

65. Precision Switches. 32-page Catalog No. 10-1 contains detailed information on the expanded line of Unimax snap-acting precision switches. Unimax Switch Div., The W. L. Maxson Corp., Wallingford, Conn.

66. Extreme Pressure Lubricants. The outstanding property reported for CMD anti-scoring lubricants is ability to withstand extreme pressures—used at 50,000 lb. psi. Folder presents lubricating applications, with comments from users. Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9.



ERICKSON
INSERTED BLADE

EQUALS DRILLING
ACTION OF TWIST DRILL

SPADE DRILLS

MORE RANGE AT MUCH LOWER COST THAN TWIST DRILLS

FULLY ENGINEERED BLADE GRIND...

Increased cross section at the cutting edge provides Greater Thermal Efficiency—Longer Tool Life than competitive blades.

FREER CUTTING ACTION

Exclusive Erickson method of grinding cutting angles gives Freer Cutting Action since end pressures are reduced.

"Heeling" eliminated.

EASY-TO-USE GRINDING FIXTURE...

Restores Original Factory Grind eliminating biggest obstacle to use of Spade Drills.

All cutting angles maintained during successive regrinds to original factory grind.

SPADE DRILL HOLDERS CORRECTLY ENGINEERED

"Funnel Effect" provided in flute design to speed chip escape.

Scientific distribution of coolant over whole cutting edge.

Send Your Drilling Problems to

ERICKSON TOOL COMPANY

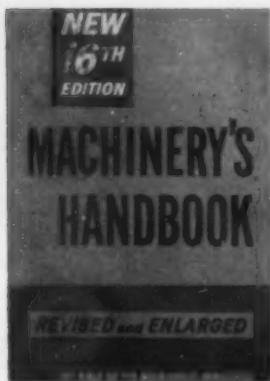
34561-12 SOLON ROAD • SOLON, OHIO

COLLET CHUCKS • EXPANDING MANDRELS • AIR-OPEATED CHUCKS • FLOATING HOLDERS • TAP CHUCKS
• AUTOMATIC INDEXING • MASTER SPACERS • DIAPHRAGM CHUCKS • PUSH-ON ARBORS • QUICK-CHANGE HOLDERS
• EXPANDING COLLETS • END-CLAMPING CHUCKS • AIR CYLINDERS (allowing stock to pass through)
• EXPANDING JAW MANDRELS • SPECIAL HOLDING FIXTURES (including gear-holding)
• BORING BARS • SPADE DRILLS • RECESSING TOOLS

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book review

Machinery's Handbook



chine-shop data obtainable. It contains 2070 pages of mechanical tables, rules, formulas, and general data.

(For the convenience of the reader, copies may be ordered directly from **Industrial Books**, Hitchcock Publishing Co., Wheaton, Ill.)

Manufacturing Management

(By Franklin G. Moore. Revised edition. 843 pages. \$10.35)

Here is an up-to-date, accurate and practical presentation of the various managerial procedures in manufacturing companies. There is valuable material on such topics as capital investment, operations research, linear programming, electronic computers, cost reduction and cost control, and research. Emphasis throughout is on management and new managerial developments.

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know-how at
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By G. F. Hawley
Vice President of
Development and
Engineering,
Automation
Engineering
Laboratories

The how
and why of
developing
equipment
for special
operations.. 1959—176 pages \$4.95



... discussing in practical terms the problems involved in developing automatic machinery for specific operations such as assembly of components, packaging of individual products and a host of other applications. Valuable to both management and production personnel as well as designers and development engineers.

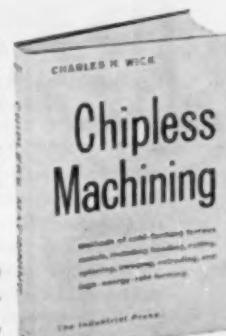
A new how-to volume on chipless machining . . . shaping metal parts without the production of chips . . .

CHIPLESS MACHINING

By Charles H. Wick

COLD-HEADING • THREAD-ROLLING • SPLINE ROLLING
POWER SPINNING • ROTARY SWAGING • RADIAL FORGING
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This basic, technical guide describes and illustrates in detail the newer methods of cold forming, gives data on economics resulting from savings in time and materials and evaluates advantages and limitations of various processes and their applications.



502 pages, 326 illustrations
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GRINDERS
CUT
FASTER, LONGER

Model "DV"

Grinds ALL drills $\frac{1}{8}$ " to $2\frac{1}{2}$ ".
 90° to 140° included angle,
2-3 or 4 lips.

SIMPLE, positive adjustments with built-in direct reading gauges allow accurate setting of clearance angle and included angle. Grinding action generates a true conical clearance angle that is constant from O.D. to web. Drill enters work easier, cuts freer, produces more holes per grind. Set-ups are fast because no chucks or collets are used. Locating on lip being ground produces accurate centering.

For a LOW COST Drill grinder with BIG CAPACITY ask your distributor about the STERLING Model "DV" or write for complete information.

McDONOUGH
MANUFACTURING CO.

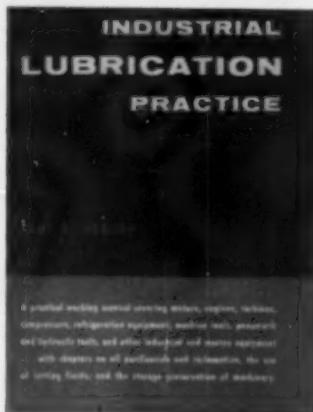
1520 Galloway • Eau Claire, Wis.

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Industrial Lubrication Practice

(By Paul D. Hobson. \$8.00)

This book is a guide to sound lubricating practice and its application to cost-saving machine operation and maintenance, and intelligent troubleshooting. It provides valuable information for the shop superintendent, the



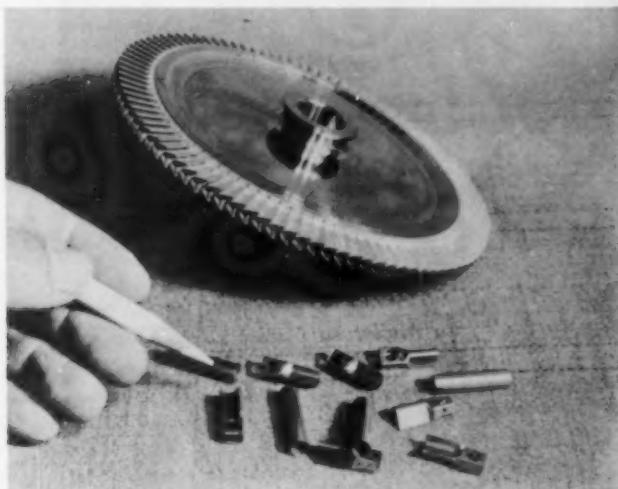
maintenance engineer, the stationary engineer, the repair supervisor, the plant lubrication engineer, and all who are responsible for the trouble-free, efficient operation of machinery, mechanical equipment and the prime movers which drive it.

(For the convenience of the reader, copies may be ordered directly from Industrial Books, Hitchcock Publishing Co., Wheaton, Ill.)



news of the industry

17



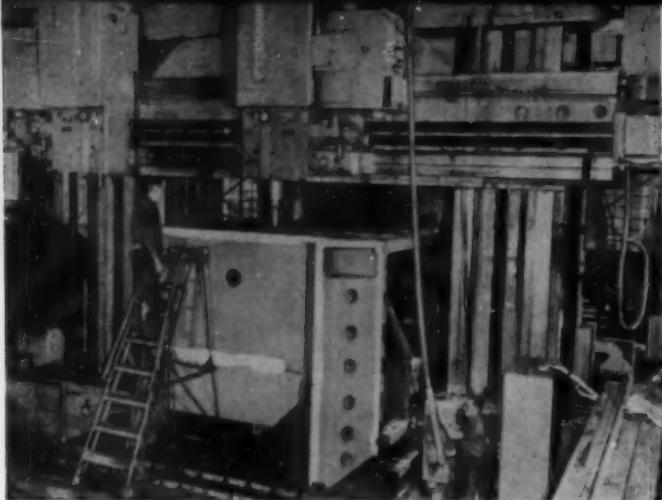
Sheet metal turbine buckets (and blanks), pointed out above, cut weight and cost of this turbine wheel by more than 50%.

SHEET METAL BUCKETS CUT COSTS OF TURBINE WHEELS

Lynn, Mass.—The successful development of sheet metal turbine buckets that cut costs and weight of small turbine wheels by more than 50% has been announced by the General Electric Co. The lightweight turbine wheel is said to represent the first practical application of these sheet metal buckets. The company's Aircraft Accessory Turbine Dept. designed the wheel for a highly advanced fuel pump. Two of these new turbine-powered fuel pumps were recently shipped for use in G.E.'s J93-3 jet engine, scheduled to power the North American B-70 Mach 3 intercontinental bomber.

In addition to being inherently lighter than conventional cast-and-machined buckets, the new high-temperature, nickel-base-alloy buckets permit further weight savings in the turbine wheel itself and protective shroud. It is claimed that the low inertia of the lightweight rotor, in turn, can simplify control mechanization, thus further reducing weight and cost. The wheel is designed to operate in air temperatures above 1000°F for up to 1000 hours without maintenance.

Sheet metal buckets for a wide variety of turbine applications are seen in the future.



Bed length is 110', clearance between beams, 14'.

14' Milling Machine Has Two-Mill Accuracy

A 14' adjustable-rail milling machine, capable of maintaining tolerances of 0.002" between the vertical and horizontal joints of huge low-pressure steam-turbine casings, has been installed in Westinghouse Electric Corp.'s steam division plant in Lester, Pa. The machine is equipped with Westinghouse developed Nultrax—a highly accurate transducer which automatically keeps the machine guide rail level with its table to assure a high degree of accuracy in all horizontal surface cuts.

Due to deflection of the rail screw under load and to varying temperature, the height of one side of the rail may differ from that of the other. Generally, the amount of this difference in a well-designed machine should not exceed 0.012". The Nultrax leveling system reduces this error by a factor of ten or more.

The bed length of the machine is 110', and clearance between the upright beams is 14'. Each of the four milling heads is driven by a 100 hp motor. The machine, one of the largest in the United States, cost approximately \$1,000,000 installed.

De Beers Now Produces Synthetic Diamonds for Industry

De Beers Consolidated Mines, Ltd., London, announces that it has arranged for the production in South Africa of synthetic diamond grit on a commercial scale. At the present time there are ample stocks of natural diamond grit for the world market. In view of the interruption of diamond mining operations in the Congo, the production of synthetic material is being undertaken as a precaution to insure that there will be no break in supplies to the market.

Pressed Metal Institute Meeting

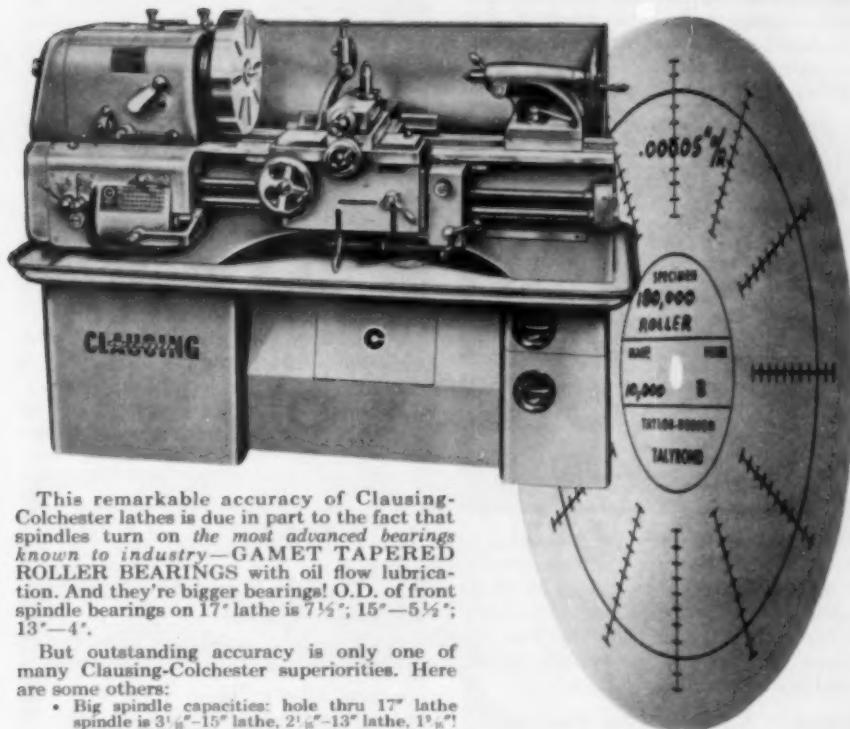
At the Annual Meeting of the Pressed Metal Institute, at Shawnee Inn, Shawnee-on-the-Delaware, Pa., October 10-14, the following officers were elected for the coming year: **M. A. Sherwood**, Grand Haven (Mich.) Stamped Products Co., president; **W. J. Primrose, Jr.**, The Dickey-Grabler Co., Cleveland, and **C. W. Cederberg**, Larson Tool & Stamping Co., Attleboro, Mass., vice presidents, and **W. Bryant Gemmill**, The American Stamping Co., Cleveland, secretary-treasurer, with **Melvin Lorenz**, HPL Mfg. Co., Cleveland, as honorary secretary-treasurer.

CLAUSING

COLCHESTER

GEARED-HEAD LATHES

turn ROUND within .0001"



This remarkable accuracy of Clausing-Colchester lathes is due in part to the fact that spindles turn on the most advanced bearings known to industry—GAMET TAPERED ROLLER BEARINGS with oil flow lubrication. And they're bigger bearings! O.D. of front spindle bearings on 17" lathe is $7\frac{1}{2}$ ", 15"— $5\frac{1}{2}$ ", 13"—4".

But outstanding accuracy is only one of many Clausing-Colchester superiorities. Here are some others:

- Big spindle capacities: hole thru 17" lathe spindle is $3\frac{1}{2}$ "-15" lathe, $2\frac{1}{2}$ "-13" lathe, $1\frac{1}{2}$ "!
- Induction-hardened bed ways.
- All-geared headstock.
- Oil bath lubricated headstock and quick-change gear box.
- Separate feed rod for power feeds.

Best of all, Clausing-Colchesters are the greatest lathe values you'll find anywhere. Prices for the 13" straight bed model start at \$2440; 15"—\$3415; 17"—\$5100. Prices include motor and magnetic controls. Gap bed and profiling lathes available in all three sizes.

Get ALL the facts. Write for descriptive literature on the "Greatest Buys in Lathe History!"

POSITIVE PROOF!

Every Clausing-Colchester must turn round within .0001". Accuracy is checked by inspecting a turned work piece on a Talyrond which measures and records in millionths on a graph like the above. Work piece and graph are supplied with each lathe as proof of its superior accuracy.

356

CLAUSING
DIVISION OF
ATLAS PRESS COMPANY

OUTSTANDING VALUES IN PRECISION MACHINES



12-309 N. PITCHER STREET, KALAMAZOO, MICHIGAN

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December, 1960

175

Foley Saw Filer Demonstrated at Damascus Fair

Over a million visitors to the Seventh Damascus International Fair, Syria, U.A.R., saw the Foley saw filer sharpen combination (rip and crosscut) circular saws automatically. The machine also files hand saws, band saws, and cross-cut circular saws.

Foley Mfg. Co., Minneapolis, was one



of 80 American firms participating in the United States exhibit, the theme of which was "Tradeways to Progress and Peace." Though Foley machinery is regularly sold abroad, this was the company's first postwar venture in the international trade fair field.

General Services To Purchase Industrial Diamond Dies

The General Services Administration announced that it seeks to purchase 3,758 industrial diamond dies for the national stockpile of strategic and critical materials. Invitations to bid, which have been sent to all die suppliers on the agency's mailing list, state that bids from both foreign and domestic sources will be considered.

Invitations to bid may be obtained from Bob Ross or Dederick Woodard, Industry Branch, GSA Defense Materials Service, 18th and F Sts., N.W., Washington 25, D.C.

Vanadium-Alloys Forms Cast-to-Shape Products Dept.

Vanadium-Alloys Steel Co. announced the organization of a new Cast-to-Shape Products Department in order to meet the requirements of American industry for tool and special steel castings. The new department, located in the main plant at Latrobe, Pa., has been manufacturing sand, shell and Shaw Process castings along with combinations of all three for the past several months with outstanding success. Castings are offered in a complete range of sizes from small to large in a wide variety of alloys melted to meet specific customer requirements. New sand molding equipment, along with the latest laboratory and foundry facilities, are available to make Vanadium-Alloys' new department a success.

Heading up the new department is Oliver H. Cook with a ten-year background in this field. Sales will be handled by Ralph C. Seikel who has many years' service in castings design, sales and materials selection.

Tool Design Upgraded Through Computer Use

The Fellows Gear Shaper Co., Springfield, Vt., reports that better designed products have resulted since the firm began using a general purpose computer in its engineering department. The rapid speed of the computer allows the engineer to explore the full range of design possibilities in gear shaper cutters, something which formerly was only approximated. The machine is a general purpose G-15 made by the Computer Division of The Bendix Corp.

Problems include the calculation of spur and helical cutters for external and internal gears with unmodified or chamfered teeth, and calculation of the power required and stresses in an injection molding machine, as well as analysis of gear errors.

Polaris Heads Get A Bang Out of Shaping Metals

Metals too tough or too brittle to form by any other method may be literally exploded into shape. For example, 54" dia. heads for the Polaris



missile are given their final contours in a specially designed explosive die, at the Edwardsville (Ill.) plant of Propellex Chemical Div., Chromalloy Corp.

A head, made of high-nickel, low-chrome alloy AMS 6434 steel, is hot-preformed. Without stress relieving or annealing, the head is loaded into the open die, and the die is then filled with water. When carefully designed charges are set off, the hydraulic pressure shapes the head to the contour of the die, assuring the desired finished component.

Sterling Die Div. Handles Sale of Thread Rolling Dies

The Sterling Die Division of Pratt & Whitney Co., Inc., will assume directly the sales and marketing function for their line of thread rolling dies. In the past the dies were sold through the P & W sales organization. The change is being made to further improve service to customers.

Herbert L. Yankee will continue as vice president and general manager of the Sterling Division. Sterling's plant is located at 13811 Enterprise Ave., Cleveland.

Leitz New SIMPLEX TOOLMAKERS MICROSCOPE

YOU GET

A COMPLETE TOOLMAKER MICROSCOPE
of 2" x 2" range in .0001" at a
basic price of \$1020. Compare
this outstanding value.

Request catalog 81/155

OPTO-METRIC TOOLS, INC.
137 BB VARICK STREET • NEW YORK 13, N.Y.



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Manufacturers' Exchange Service

Manufacturers have often found themselves stocked with items not required for current or future production, with no ready market for them. Conversely, there has been no economical method of locating items from other manufacturers' inventories.

With the purpose of bringing these potential buyers and sellers together, the Manufacturers' Exchange Corp. has been organized by Jay H. Petter, a director of the Michigan State Chamber of Commerce and a long-time manufacturer of heavy industrial machinery.

Subscribers furnish the organization listings of standard items which they want to buy or sell. These are coordi-

nated alphabetically and sent at intervals to all subscribers. Each subscriber is given a code number and contact between the prospective buyer and seller is made through the Manufacturers' Exchange Corp., Peoples State Bank Bldg., Holland, Mich.

Superior Steel Products Changes Name

Superior Steel Products Corp. of Milwaukee has announced that the corporation's name has been changed to Superior Die Set Corporation. It was concluded that the new name would better identify the corporation with the manufacture of die sets. The newly opened Superior plant at Cheshire, Conn., will be known as Superior Die Set Corp., Eastern Division.

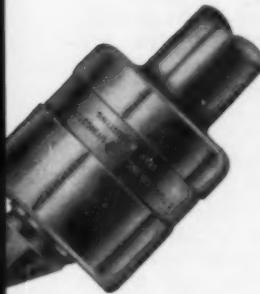
National Tool and Die Association Elects New Officers



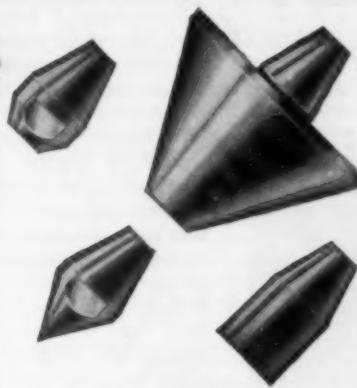
New officers of the National Tool, Die & Precision Machining Ass'n (formerly called the National Tool & Die Manufacturers Association) were elected for 1960-61 during the 15th annual convention of the organization in Minneapolis. From left to right are: John D. Dewhurst, first vice president, (president, Arrow Tool Co., Inc., Wethersfield, Conn.); Fred D. Wright, secretary, (president, Fred D. Wright Co., Inc., Nashville, Tenn.); E. W. Barnwell, second vice president, (president, Apex Corp., Roseville, Mich.); Harold G. Murdock, president, (vice president, Arrowsmith Tool & Die Corp., Los Angeles); Rolf H. Berg, treasurer, (vice president and treasurer, Atols Tool & Mold Corp., Chicago). Charles R. Bender, at extreme right, was appointed executive secretary.

Precision-Built

SELF-ADJUSTING LIVE CENTERS



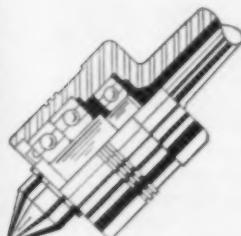
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Accurate Detachable Points



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Lathe Centers



H Type Live Center
Heavy Duty



SS 16, Super
Sensitive Live Center



Solid Center
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- EXPANSION COMPENSATORS AND DIVIDED THRUST
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- HARDENED AND GROUNDED THROUGHOUT

CENTERS TO YOUR SPECIFICATIONS ON REQUEST



J & S TOOL COMPANY, INC.
882 DORSA AVE.

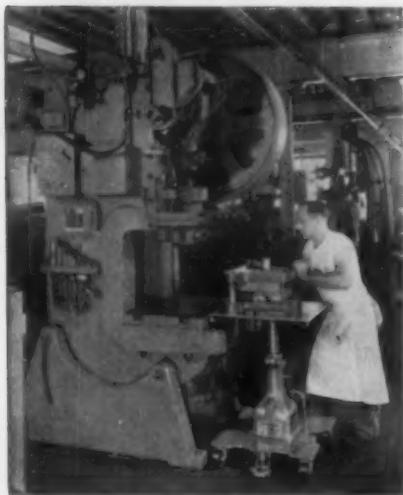
LIVINGSTON, N.J.
WYman 2-3181

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December, 1960

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(Eliminates Cranking)**



2000 LBS. OR *1000 LBS. CAPACITIES
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**A precision made
MIDWEST TABLE
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180

**Racine Hydraulics Establishes
Foreign Subsidiary**

Formation of Racine Hydraulics Co., Ltd., a wholly-owned foreign subsidiary with headquarters at Zug, Switzerland, is announced by Racine Hydraulics & Machinery, Inc., Racine, Wis. Gordon Fuller, who has been in charge of Racine Hydraulics' foreign operations, heads the Swiss company. A technical staff is contemplated for this function, with its members serving as a sales force not only for the U.S. plants of Racine Hydraulics & Machinery, Inc., but for overseas affiliates such as Vickers-Armstrongs (Engineers) Ltd. of England, with whom a cross-licensing agreement was recently completed.

Skinner Chuck Co. Renamed

Stockholders of The Skinner Chuck Co., New Britain, Conn., voted to change the name of the company to Skinner Precision Industries, Inc. In announcing the change of name, it was pointed out that the historical and important name of The Skinner Chuck Co. was not overlooked. This will be retained by the designation of the Chuck Division as Skinner-Horton Chuck Division. The name of the Valve Division will remain the same—Skinner Electric Valve Division.

Obituary

Frank W. Curtis, nationally known induction and dielectric heating expert, died at his residence in Sarasota, Fla., on October 17. His birthplace was New York City, May 23, 1895.

Curtis was a past president of the American Society of Tool and Manufacturing Engineers and during his 25 years of service to the organization, served on the Honor Awards, Technical Publications, and Editorial Committees, and spearheaded the establishment of chapters in Pittsburgh and Springfield, Mass. He had been retired for several years, having last been branch manager of Morris Twist Drill Co., Detroit.

Appointments and Promotions

Personnel Changes . . . Executive and Production



W. E. Anderson



O. Ahlers



J. S. Randall



H. G. Shackle

Lawrence V. Whistler, Jr. has been elected president of S. B. Whistler & Sons Co., Buffalo. He succeeds his father, **Lawrence V. Whistler, Sr.**, who has moved up to chairman of the board . . . Cosco Corp. of New York City announced the appointment of **Wallace E. Anderson** to vice president and general sales manager for all their imported precision and automatic machine tools . . . **Leon Mollick** has been named manager of engineering, Industrial Equipment Div. by the Baldwin-Lima-Hamilton Corp., Philadelphia . . . **C. Therpe Thompson** has resigned his position as vice president and general manager of The Sheffield Corp., Dayton, with **Oscar Ahlers** selected as his successor. **Louis Polk, Jr.**, has resigned as vice president of operations to accept an executive position with the General Mills Corp. of Minneapolis. Succeeding him is **Roy Heldenbrand** who is being transferred from his position as president and general manager of a Sheffield subsidiary, the Threadwell Tap & Die Co. . . . Directors of Kearney & Trecker Corp., Milwaukee, elected **John S. Randall** executive vice president to succeed **Ralph W. Burk** who retired in 1958 . . . **Edward P. Sandbach**, formerly the division's chief metallurgist, has been appointed manager of manufacturing of the Mackintosh-Hemphill Div. of E. W. Bliss Co., Canton, Ohio. In his new position, Sandbach will be in charge of manufacturing operations at the division's Pittsburgh and Midland, Pa. plants. Bliss has also named **M. Gene Shackle** to the office of secretary, **James T. Harrington** as director of public relations, and **James A. Bray** as manager of trade relations . . . Clearing Div. of U.S. Industries, Inc., Chicago, has appointed **E. P. Cunningham** as senior vice president-director International Operations, **E. J. Baumrucker**, vice president-Domestic Sales, and **Boyd Helm**, general-manager Die Division . . . **Charles R. Bender**, who has served as assistant executive secretary of the association since 1953, has been appointed executive



L. Mollick



R. Heldenbrand



E. P. Sandbach



J. T. Harrington



J. A. Bray



E. J. Baumrucker



G. Carvalho



P. Hanscome

secretary of the National Tool, Die & Precision Machining Ass'n, Cleveland. This was announced by **George S. Eaton**, who has been serving both as executive secretary and executive vice president . . . Three company executives, now general managers of subsidiaries, have been promoted by Jarvis Corp., Middletown, Conn. to corporate vice presidents. The three men are **George Carvalho**, general manager, Machine Tool & Attachments Subsidiary, Middletown, Conn.; **Joseph Brescia**, general manager, Tap Subsidiary, N. Attleboro, Mass., and **Paul Hanscome**, general manager, Carbide Tool Subsidiary, Lynn, Mass. . . .

Ollie Roberts, a Barnes sales engineer, has been appointed by W. O. Barnes Co., Inc., Detroit, to the newly created position of director of Training and Customer Service Laboratory . . . **James P. Malmstrom**, with a background in the aircraft and missile fields, has been named vice-president of Koehler Aircraft Products Co., Dayton . . . **Henry M. Margolis** has been named to the newly created post of chairman of the board for The Elgin National Watch Co., Elgin, Ill. At the same time, **George J. Daly, Jr.**, executive vice president and treasurer, was named chief executive officer. The changes followed the resignation of **James G. Shennan** as president of the board . . . **Irvine F. Williamson**, with the Worcester firm since 1954, has been appointed superintendent of Norton Co.'s Santa Clara, Calif. plant . . . Appointment of **David W. Thomas** as group officer of the Chicago plant has been announced by Solar Steel Corp., Union, N.J. Thomas will supervise the local management of the Chicago plant, which is headed by **John Kieffer** . . . **William F. Martin** has been appointed vice president and assistant general manager of the Mechanics Universal Joint Div. of Borg-Warner Corp., Chicago. He will report to and assume many duties formerly the responsibility of **Frank W. Rickard**. Rickard, who remains as president of Mechanics, was recently elected a group vice president of Borg-Warner with supervision over a number of automotive parts divisions . . . **Dr. George E. Barker** has been named vice president and director of research at the Van Straaten Chemical Co., Chicago. In this



E. P. Cunningham Sr.



C. R. Bender



J. Brescia



O. Roberts



J. P. Malmstrom



W. Thompson



J. B. Anderson



H. C. Daum

capacity he will direct all of the company's research in every field and on all types of products, including metal cutting, grinding and cleaning compounds . . . **Donald R. Platt**, formerly manager of engineering of the Time Equipment Div. of IBM Corp., has been appointed vice president of engineering and research for Veeder-Root Inc., Hartford, Conn.

Personnel Changes . . . Sales and Service

Wilfred Thompson has assumed his new duties as vice president-sales for The Bullard Co., Bridgeport, Conn., having

had long experience with the company. Thompson had been district sales manager with headquarters in Detroit, since 1950. He held various Bullard jobs previous to that time . . . **James B. Anderson** has been appointed manager of Kendex Tooling Sales with headquarters in Willoughby, Ohio, as announced by Kennametal Inc., Latrobe, Pa. . . . Buhr Machine Tool Co., Ann Arbor, Mich., has named **Henry C. Daum** as vice president in charge of sales . . . Firth Sterling Inc., Pittsburgh, has promoted **John J. Sewko** to sales manager, product development, Carbide Div., and **Norman E. Donnelly** to Pittsburgh district manager, Carbide Div.

Designed for Small Parts Treating . . .



Write today for literature on complete line of Huppert Furnaces and Ovens in floor and bench models. Ask for "Hints on Heat Treating."

HUPPERT DeLuxe

ELECTRIC FURNACES

* Here's a series of compact, durable furnaces that are ideal for tool and die shops and small laboratories. Any desired temperature within the range of 250° to 2000° F. is controlled by an accurate built-in Huppert Temperature Controller. All-steel construction — multi-insulation — sturdy Kanthal elements — counterweighted doors — removable porcelain tray.

Model No.	Inside Dimensions			Temp. Range	Watts 110 Volts AC	Price
	Wide	High	Deep			
434DL	4½"	3½"	4½"	325°—1850° F.	920	\$ 90.00
439DL	4½"	3½"	9"	325°—1850° F.	1650	120.00
436DL	4½"	3½"	6"	250°—2000° F.	1650	130.00
50L	4½"	3½"	9"	250°—2000° F.	1750	176.00
90L	6"	6"	6"	250°—2000° F.	2200	200.00
669DL	6"	6"	9"	250°—2000° F.	3600	248.00
100L	8"	4"	6"	250°—2000° F.	2000	220.00
849DL	8"	4"	9"	250°—2000° F.	3000	265.00

K. H. HUPPERT CO.
Manufacturers of Electric Furnaces and Ovens

6845 Cottage Grove Ave., Chicago 37, Illinois

Available for 220 Volt AC
at small additional cost.
Stainless steel housing
slightly higher.

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PUSH BUTTON Speed Selection from to in seconds



or to any intermediate speed, instantly

Just push a button and watch the large tachometer dial on the headstock!

It's that easy!

The work is done by a motor driven speed changer. It accelerates or slows the lathe to any desired speed, in seconds. With a 10:1 ratio, this new variable drive makes it easy to select from a wide range of speeds—200 to 2000 rpm in direct drive and 40 to 300 rpm in back gear.

Maximum stability and smooth

power transmission are assured because the drive unit is oversized. All pulleys and shafts are fully supported (eight bearings). Double V-belts throughout the drive eliminate slippage and deliver full power to the spindle. Because of this rigidity and extra pulling power, this lathe will take heavy cuts at all speeds and precision finish cuts at high speeds.

It is a precision lathe, moderate in price, with the versatility for toolroom, production or second operation jobs.

SHELDON Variable Speed PRECISION LATHES



Illustrated
WM56P
13" Swing- 34" Centers

Write for
"Variable Speed"
Circular and General
Catalog showing . . .
• 10", 11", 13" and 15"
• SHELDON
Precision Lathes
(Bench, Pedestal
and Cabinet types)

• 13" and 15"
SEBASTIAN
Gared Head
Lathes

• SHELDON
Milling
Machines

• SHELDON
Back Gared
Shapers

SHELDON MACHINE CO., INC.

4242 N. Knox Ave.

Chicago 41, Ill.

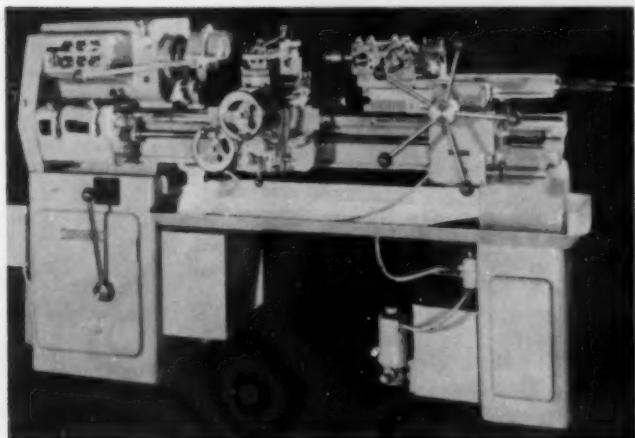
Use postpaid card. Circle No. 308

what's new in metalworking

WORKING STATIONS OF LATHE EQUIPPED WITH POWER FEEDS FOR BEST FINISHING

The new Sheldon 3R universal ram type turret lathe claims unusual versatility since it is equipped for turning between centers and single point threading, in addition to standard turret operations. Bar capacity is $1\frac{1}{2}$ ", swing over beds is 15", and swing over cross-slide is 8". These clearances permit use as a chucking machine as well as for bar work.

The ram turret has six working stations. The turret is



Lathe can be used as a chucking machine, for bar and collet work, and for straight turning and facing on a wide variety of work.

equipped with a power feed box for increased accuracy and finish of machined parts. Power feeds are engaged electrically by pressing pushbutton controls. Turret travel is 10" and each turret face accommodates $1\frac{1}{2}$ " standard shank tooling.

A universal carriage provides both power longitudinal and power cross feeds through apron clutches. Lathe can then turn between centers up to its maximum center distance of 33". 16 spindle speeds from 22 to 1250 rpm are available through the 5 hp two speed geared motor; optional, 32 to 1800 rpm.

Price is \$7,167.00 f.o.b. Chicago.

Sheldon Machine Co. Inc., 4258 N. Knox Ave., Chicago 41.

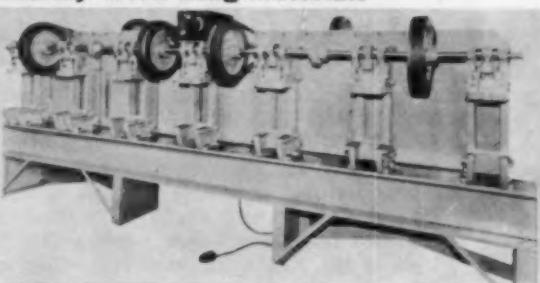
Use postpaid card. Circle No. 68

Seven Punch Presses Unitedly Work Long Materials

The Kenco Mark VII-SE, which uses seven 8-ton punch presses, evenly distributes 56 tons throughout a 16' length. Incorporated are the features of no stored kinetic energy in the flywheel and a complete absence of any clutch mechanism.

With these factors at hand, complete safety to the operator and the die is maintained. The operator must fully depress two palm buttons, which are widely spaced out of the danger area. If at any time during the cycle the operator releases either hand, the unit stops immediately and all power shuts off instantly.

Through installation of fault detectors in the die and disconnectors in the con-



Complete safety to operator and die is maintained.

trol cabinet, malfunctions can be instantly detected and the machine stopped.

This unit can be produced with an infinite number of synchronized motors, thus eliminating age-old problems encountered in fabricating long materials.

Kenco Mfg. Co., Los Angeles 22, Calif.

Use postpaid card. Circle No. 69

Bending Machines Handle From $\frac{1}{2}$ " to 4" I.P.S. Pipe

Three machines in the Compact Line handle from $\frac{1}{2}$ " to 4" I.P.S. pipe. These machines are designed for low production jobs, one-of-a-kind or experimental parts, maintenance, and similar fabrication work. They are designed for ease of operation and set-up, light weight for portability, and compactness for minimum floor space requirements.

The two larger machines in the line—Models C-2 and C-4—feature direct hydraulic operation of the pressure dies. Pressure is adjusted by a manual control valve, and exact gauge pressure can easily be read and recorded for subsequent duplication of set-up.

The largest machine, Model C-4, has capacity up to 4" I.P.S. standard pipe or equivalent, such as 5"x5"x $\frac{3}{8}$ " steel angle or 2 $\frac{1}{8}$ " dia. solid steel bar. It handles a maximum radius of 36" and bends to 180°. Model C-2 has a range up to 2" I.P.S.

The original Compact bender, the



Model C-4 Compact bending machine in use bending 4" I.P.S. standard pipe on a 12" centerline radius to 90° angle.

Model 1400, has a capacity up to $\frac{1}{2}$ " I.P.S. pipe or 1 $\frac{1}{8}$ " dia. steel tubing.

Pines Engineering Co., Inc., 601 Walnut St., Aurora, Ill.

Use postpaid card. Circle No. 70

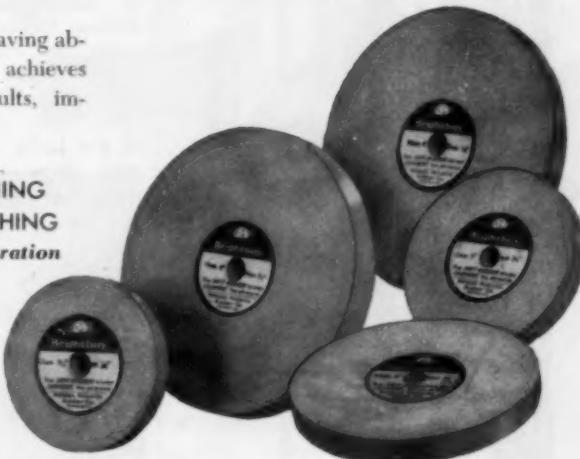
A New Approach to Bigger Time Savings

MULTI-USE, SOFT RUBBER BONDED ABRASIVES THE ONLY COMPLETE, COMPREHENSIVE STOCK LINE!

Brightboy's unique, time-saving abrasive-and-rubber action achieves exceptional precision results, improved product quality.

Simultaneous
**BURRING • CLEANING
FINISHING • POLISHING**
frequently in one operation

BRIDGES THE GAP
BETWEEN
THE GRIND
AND THE BUFF



*Works all metals, wood, glass,
laminated materials, some
plastics*

Readily available Silicon Carbide and Aluminum Oxide grains—grades extra fine to extra coarse—in soft, semi-firm, firm and tough rubber binders. 49 numbers, JOB-MATCHED to conventional and automation production methods.

NEW **BRIGHTBOY** CATALOG

gives new and revised wheel sizes, center hole specifications conforming to American Standards safety specifications, machine speeds, grains and textures.

No plant should be without this valuable reference catalog describing this revolutionary new concept of abrasive applications.

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BRIGHTBOY INDUSTRIAL DIVISION

WELDON ROBERTS RUBBER CO.

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America's Pioneer Manufacturer of Rubber-Bonded Abrasives

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December, 1960

187

*Hardened, Tempered and
Ground-from-the-Solid!*



It pays to specify

ACE **DRILLS** **REAMERS** **BLANKS**

Premium Quality
High Speed Steel,
Solid Carbide and
Carbide Tipped.

Call your local distributor today—or write Ace direct for latest catalog and price information.



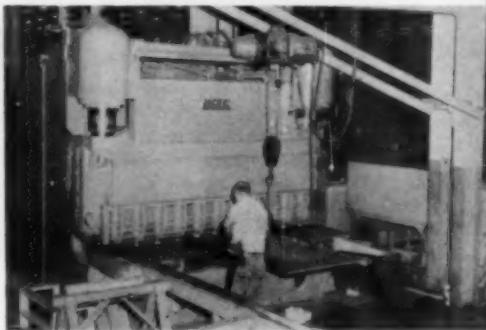
ACE DRILL
Adrian, Michigan

ORIGINATORS OF "GROUND-FROM-THE-SOLID" DRILLS

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Shear Cuts Light Material With Minimum Bow & Twist

Adjustable rake angle enables a single hydraulic shear to cut both heavy plate and narrow strips of light gauge material with minimum bow and twist at Caterpillar Tractor Co., Joliet, Illinois. By a simple one-minute adjustment, the rake of this massive $1\frac{1}{2}$ " shear can be set to the most efficient cutting angle for any thickness of material. With similarly rapid adjustment of the knife clearance, this reportedly



The rake of this $1\frac{1}{2}$ " shear can be speedily set to most efficient cutting angle for any thickness of material.

largest adjustable rake shear ever built cuts a complete range of metals from light sheet to 1" plate to an accuracy of .030" over the entire 10' bed length. Shorter pieces over 1" thick are cut to .125" accuracy. Shockless, hydraulic pressure extends knife life and permits operation of shear on ordinary, low cost concrete pads.

Pacific Industrial Manufacturing Co.,
848 49th Ave., Oakland, Calif.

Use postpaid card. Circle No. 71

Rapid Positioning Table Eliminates Box Fixtures & Jigs

A new Burgmaster positioning table eliminates expensive jigs and fixtures for precision drilling, reaming, tapping, etc., operations. This inexpensive unit is for accurate positioning of work on drill presses and is particularly effective when used in conjunction with



IT WAS A STEP FORWARD

When granpa changed
from the

Old Flat Drill



to the

Modern Twist Drill



IT WILL BE ANOTHER STEP FORWARD

When YOU change from the

Old Hook Type Boring Tool



to the

Modern Precision Boring Tool



WITH the old type of tool the clearance is usually ground by hand; even an experienced operator finds it difficult to control the clearance angles.

With the Precision Bokum Boring Tool the proper clearance is built into the tool. All resharpening is done from the top surface only, in this respect the tool is like a form tool wrapped around a shank, the curvature being such that the clearance angle remains constant throughout the life of the tool. As with any form tool the life of the Bokum Boring Tool is many times that of an ordinary tool.

Available: Wide range of sizes for boring holes from 1/16" dia. up . . .
in super high speed steel and Carbide Tipped.

For general boring, use Style A • For facing and bottoming, use Style B
For internal threading, use Style C



TRADE MARK REG. U.S. PAT. OFF.

BOKUM TOOL CO. INC.

14775 Wildemere Ave., Detroit 38, Michigan

Use postpaid card. Circle No. 311

three Models of Burgmaster six-spindle turret drilling machines—manually operated Model "1C" and Bench Model "O" with drilling capacities of $\frac{1}{2}$ " and $\frac{1}{4}$ " respectively, and the Automatic Bench Model Turret Drill with power feed, $\frac{1}{4}$ " capacity. The table working area is 4" x 5" and positioning accuracy is $\pm .0005"$.

At the release of a thumb button on the table positioning handle, an air-operated shot pin drops into a hole

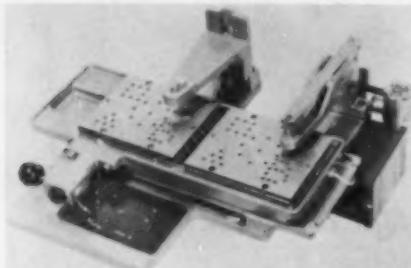


Table working area is 4" x 5"; positioning accuracy is $\pm .0005"$.

in the master template, locking the table in position.

Where the degree of accuracy is such that bushings are required, an optional outboard support bracket with its own bushing liner can be used, eliminating the need of a fixture.

Burgmaster Corp., 15001 So. Figueroa St., Gardena, Calif.

Use postpaid card. Circle No. 72

Power-Driven Dressing Tool

The Sidley diamond Crushcutter traverse dressing tool consists of an alloy wheel into which are set many diamonds in rows across the peripheral surface. It is power-driven and electronically controlled with stepless speed variations. The tool is also available as a free running unit, actuated by the grinding wheel itself. It is designed to dress all kinds of grinding wheels on any kind of operation.

It has been reported that the combination rotary and traversing action of the dressing tool enables the user



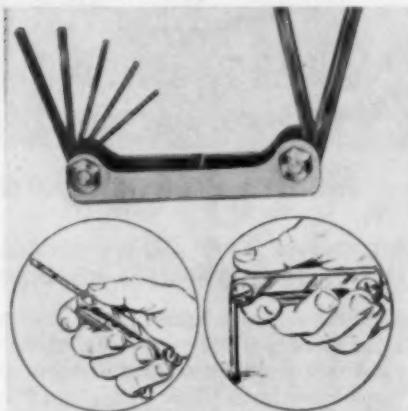
to dress wheels speedily and accurately with less friction.

Sidley Diamond Tool Co., 26045 W. 7 Mile Rd., Detroit 40, Mich.

Use postpaid card. Circle No. 73

Hex Key Set Saves Time

A new style, precision-made hex wrench, which cuts down time spent looking for individual hex keys, is



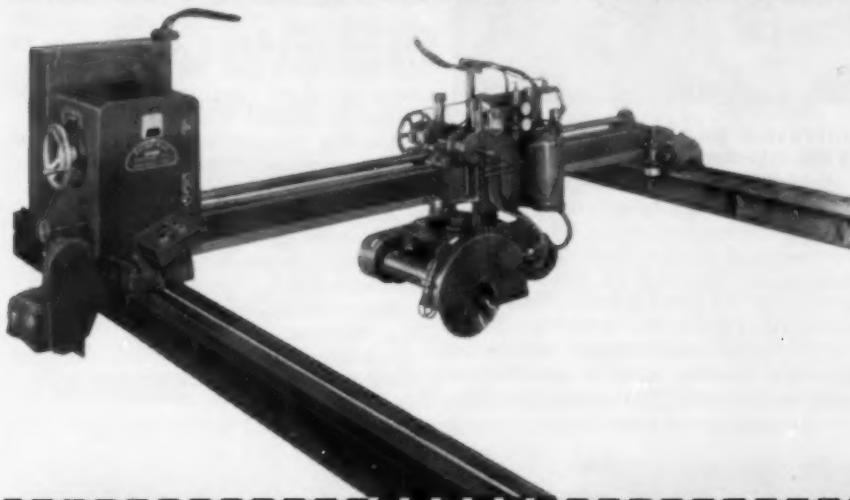
being manufactured by Eklind Tool & Mfg. Co., 2627-MT N. Western Ave., Chicago 47, Ill.

Called the Fold Uni Key, the tool now comes in three models, fits all types of hex socket set screws from No. 5 to $\frac{3}{4}$ ". Each hex key opens and closes like a jack knife blade and automatically snaps into right angle position for greater leverage or extends straight out like a screwdriver.

Sets come in three sizes.

Use postpaid card. Circle No. 74

ECONOMY SAW CUTS SHEET STOCK WITH 4-WAY ACTION



**Accurate Squares up to 10 ft. Wide
Any Length — Cuts Metal or Plastics**

The new Ty-Sa-Man Economy "111-CX" produces accurate square rectangles up to any length, and up to 10 feet wide, from stock up to two inches thick. Motor and arbor travel on a transverse rail, which moves along two side rails. This four-way movement, in combination with the 90 degree swivel head, permits trimming all four sides of a plate without moving it. Handling time is reduced to a minimum.

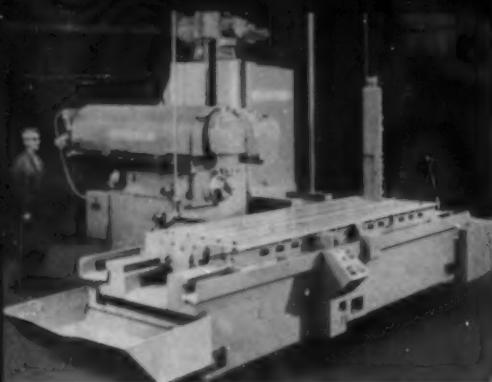
Ty-Sa-Man
SINCE 1885

Write for FREE BULLETIN
TY-SA-MAN Machine Co., Inc.
800 White Ave., Knoxville, Tenn.

Use postpaid card. Circle No. 312

December, 1960

191



Universal Bed-Type Miller With All-Angle Head

A 50 hp universal bed-type milling machine combines longitudinal feed of the table, cross feed of the column, and vertical feed of the head. These feed motions are powered by motors independent of the spindle motor, thus providing full horsepower to the spindle.

A 50 hp horizontal spindle and 20 hp all-angle spindle make it possible to machine vertical, horizontal, and all-

angle faces in one set-up. The 20 hp all-angle spindle can be power positioned over the table and manually positioned through 360° in planes parallel and crosswise to the machine table.

Twenty-four speed changes are available on both the horizontal spindle and all-angle spindle in a range from 14 to 1540 rpm. With the main spindle the hp range is 1 hp per rpm up to 50 hp maximum, and with the all-angle head ½ hp per rpm up to 20 hp maximum.

Various operations can be handled with minimum repositioning of workpiece.

All feeds and speeds are controlled by push button from the pendant which is easily positioned for convenient operation.

Numerical control can be applied to this machine.

Sundstrand Machine Tool, Div. of Sundstrand Corp., Belvidere, Ill.

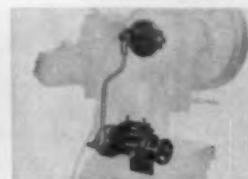
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**America's
largest selection of
economically priced
PRESS ROOM
EQUIPMENT**

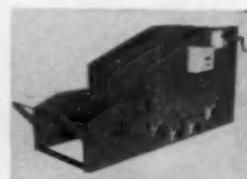
Durant

TOOL COMPANY
17 Thurbers Avenue
Providence 5, Rhode Island

Our nearby
representatives will
be pleased to be
of service to you
without
obligation.



ROLL FEEDS, 17 Models from \$150.



COIL CRADLES, 40 Models from \$285.

Write for new, free catalog detailing a complete selection of Wire and Stock Straighteners, Die Set Pullers, Stock Oilers, Stock Reels, and Motor Driven Scrap Choppers . . . Over 100 necessary pieces of equipment for the modern press room.



PRESS RAM SCRAP CHOPPERS, 5 Models from \$69.



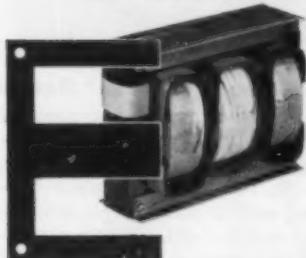
TOOL and DIESMAKER'S PUNCH HOLDERS, only \$19.50

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**Cleveland Tool and Die
CASE FILE**

"12 to 15 TIMES LONGER DIE LIFE"

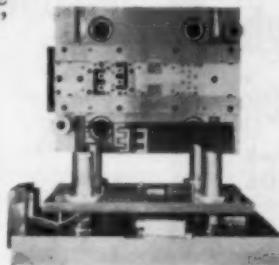
CTD PRECISION CARBIDE DIES SPEED OUTPUT OF "FRANCEFORMER" LAMINATIONS



Check the transformer on the next neon sign you see, and chances are it'll read "Franceformer"—trade mark of the France Mfg. Co. of Cleveland, O. This aggressive company supplies leading jobbers of neon signs throughout the country. For high-speed lamination production, France chooses CTD precision

tungsten carbide dies. "CTD dies give us continuous production with far less downtime," says Emil Olds, plant manager. "We get 12 to 15 times the die life at only 3 times the previous cost."

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OF THE IMPORTANT
PRODUCTION EFFICIENCY
MADE POSSIBLE BY CTD
PRECISION CRAFTSMANSHIP**



Cleveland **T**ool and **D**ie *means precision...*

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Send for brochure describing CTD's plant and facilities.



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government surplus TWIST DRILLS

NEW, and in original
wrappers . . . Cleveland
and National Brands

ALL SIZES 17/64 THROUGH 3"

50%
off
current
high
speed
list



If you are using high speed drills, you will find that for most jobs carbon will work just as well—and better in some cases. We urge you to try them as you will realize a saving of at least 50%. Order now!

LAFAYETTE SUPPLY COMPANY
113 Crosby Street New York 12, N.Y.
Telephone: CANal 6-3699

Use postpaid card. Circle No. 315

194



Tester's Chamber w/450° Range

Designed for both moderate production and environmental testing, continuous operation or intermittent use, this 2 cu. ft. unit includes many features found only in some larger models. The Model A-120-2-HC affords a temperature range from as low as -150°F to as high as +300°F ($\pm 2^\circ$) with indicating controller. (Recording-programming as optional features).

Chamber 24" x 12" x 13½", fin coil and blower, two 2" ports, and lid with multipane frost-free window make this self contained portable unit ideal for job shop or R/D applications.

Cincinnati Sub Zero Products, 3932 Reading Rd., Cincinnati 29, Ohio.

Use postpaid card. Circle No. 76

Optional Planer Ways Increase Load Carrying Capacity

Non-metallic table ways, available as optional equipment on the new Flying Scot small planer, made by the G. A. Gray Company, Cincinnati 7, Ohio, are said to increase load carrying capacities 100% over the maximum capacities of cast iron ways. By permitting higher cutting and return speeds, these ways substantially increase planer productivity, and result in greatly reduced planing costs.

The ways consist of laminated plastic plates cemented and pinned to the table

MACHINE and TOOL BLUE BOOK



ways. Higher cutting and return speeds are achieved, because heat generated at the bearing surfaces of the vees is virtually eliminated.

The Gray Flying Scot is reported as the first low-priced planer designed and built for modern fast carbide planning. Single or double cutting heads are available in any combination. Nine combinations of table widths and heights are available; machines in 30", 36" and 42" sizes.

Use postpaid card. Circle No. 77

DUSTKOP "520"

designed to collect dust from
single machines



portable —
easily installed



Self-contained Dustkop models like the "520," are practical and effective in collecting dust from single machines. They're designed specifically for service with surface grinders, tool and cutter grinders, offhand

grinders, buffers and other small wheel equipment. These units are also easy to install — are actually portable — and very economical to operate.

Write for illustrated literature

46 models to choose from!

NEW DUSTKOP AUTO-SHAKER
shakes filters AUTOMATICALLY

AGET manufacturing company
1402 E. Church Street, Adrian, Michigan

ask for
details

Use postpaid card. Circle No. 316

December, 1960

5 Ton Deep Throat O.B.I. Punch Press

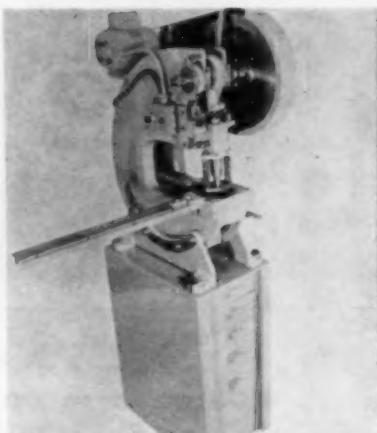
A new five ton O.B.I. punch press, with 12" throat depth, allows working to the center of a 24" sheet. This Di-Acro No. 5 model can be used for high-speed production operations. Flywheel speed is 210 strokes per minute—the machine can be set up for continuous operation at this rate by removing the cam from the trip mechanism. Practical rate for single stroke cycling of the press would be 150 strokes per minute.

Material stripper is spring loaded and does not require adjustment for different material thicknesses. Less experienced help can operate the press.

Both single station and multiple hole punching can be performed by installing proper die set.

Besides perforating or blanking metals, the press can also be used for material such as plastic, leather, rubber, etc.

Cost is \$595.00 f.o.b. factory.



Press can be equipped with an Exten-Tab gauge that provides two-way material stop. Gauge extends 12" back and 24" to side and is ruled with 1/16" graduations.

O'Neil-Irwin Mfg. Co., 562 8th Ave.,
Lake City, Minn.

Use postpaid card. Circle No. 78

14" Air-Operated Automatic Cutoff Machine

The new machine, for tubing, extruded shapes and bars, both ferrous and non-ferrous, is said to eliminate need for more expensive machines normally used for this work, and sells for under \$2,000.

The machine is completely air-operated. All controls for cutting head and material feed are non-electrical. It will cut most shapes to 3" in standard bar lengths, solid stock to 1 1/4", feed stroke is variable from 3/16" to 8". The machine features quick setup for semi-automatic or completely automatic cycling and can be used for short run and maintenance-type cutting.

14" wheel travels at 3,000 rpm, spindle diameter is 1". Machine operates on 10 to 100 psi, and averages 2 1/2 to 4 cu.ft./min. on continuous duty. Spindle drive motor is 5 hp 220/440 V. three phase.



Cuts most shapes to 3" in standard bar lengths, solid stock to 1 1/4", feed stroke is variable from 3/16" to 8".

Cleveland Pneumatic Industries, Inc.,
Industrial Products Div., 2415 N. Bur-
dick St., Kalamazoo, Mich.

Use postpaid card. Circle No. 79

A LITTLE PUNCH WITH **BIG** IDEAS

WHITNEY-JENSEN
**HAND METAL
PUNCH**

(BENCH OR FLOOR MODEL)

BUILT LIKE A PUNCH PRESS

CAPACITY

MILD STEEL

2" THRU 14 GA.

1/4" THRU 3/16"

WILL TAKE

MANY OF OUR
SPECIAL PUNCH
AND DIE SETS

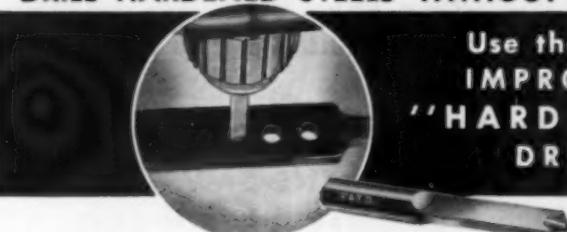
Write for Literature

WHITNEY METAL TOOL CO.
718 Forbes St., Rockford, Illinois



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DRILL HARDENED STEELS WITHOUT ANNEALING —



Use the New
IMPROVED
"HARDSTEEL"
DRILL

With the new, improved "HARDSTEEL" Drill, you can do accurate, smooth drilling, countersinking, counterboring and reaming in steels hardened by any process without first annealing the work. And they work with equal ease on work-hardening steels and high carbon - high chrome steels of any degree of hardness. "HARDSTEEL" Drills fit standard drill presses. They save time and reduce rejects. They permit engineering changes requiring additional drilling after hardening. And parts drilled after hardening always match at assembly. Write for a copy of the "HARDSTEEL" Operators Manual showing how "HARDSTEEL" Drills are cutting costs in thousands of plants.



BLACK DRILL COMPANY, INC.

1374 East 222nd Street • Cleveland 17, Ohio

YOU HARDEN IT —
WE'LL DRILL IT WITH —

"HARDSTEEL"

Use postpaid card. Circle No. 318

New Series Expendable Diamond Dressing Tools

The new NR series of non-resettable and expendable diamond dressing tools are said to provide for new savings and efficiencies in grinding wheel dressing costs. It is reported that only the finest single point diamonds are used in these tools, thus allowing for a maximum number of wheel dressings per tool.

Advantages reported include the elimination of resetting and the expenses that go with it, lower initial costs, and inventory reductions since the company maintains large stocks of these tools.

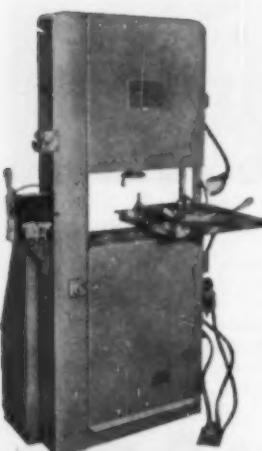
The used diamonds can be turned in for salvage value.

The tools come in a variety of shapes and diamond sizes for all type straight and form dressing needs.

Diamond Tool Research Co., Inc., 380 Second Ave., New York 10, N.Y.



NR Series of diamond dressing tools.
Use postpaid card. Circle No. 319



W. WHITNEY STUECK Inc.

Use postpaid card. Circle No. 319

P. O. BOX 355B
OLD SAYBROOK, CONN., U.S.A.

Direct Reading Micrometer

Speedmike direct reading micrometer, manufactured by J. T. Slocomb Co., 65 Matson Hill Rd., Glastonbury, Conn., is read numerically and directly from the three numbers appearing in three round windows on the frame. It offers instant reading, eliminates .025" errors, cuts waste, and can be used by a semi-skilled operator. Numbers are expressed in thousandths of an inch (.000"). Grad-



ations on the thimble provide for simple interpolation for reading tenths of a thousandth (.0000") of an inch.

Use postpaid card, Circle No. 81

Eliminate Sharpening and Blade Adjusting



Wetmore Indexable Insert Milling Cutters are available in a wide range of standard types and sizes. Write for completely descriptive Catalog No. 06-D.

with Wetmore Indexable Insert Milling Cutters

Simply unclamp and index the carbide inserts to renew the cutting edges—eight sharp edges per insert. Two-piece body construction permits precision grinding of insert seats during manufacture and insures perfect alignment of inserts after indexing.

Inexpensive replacement cost of indexable carbide inserts and their much greater convenience in milling operations lead to unprecedented economies. Wetmore designs utilize precision ground insert blanks that are standard with leading manufacturers and are readily available from local suppliers' stocks.

Wetmore Tool & Engineering Co. Angelus 9-7266
5320 E. Washington • Los Angeles 22, California Phone: TWX: LA 2085



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POT-TYPE SALT



BATH FURNACE

The features listed below are but a few of the in-built advantages of the **LUCIFER 2055 SERIES**.

- Eliminates atmospheric problems (oxidation, scaling and decarburization)
 - Rapid constant heat
 - Choice of 10 models
 - Heat ranges to 1,700° F.
 - All controls included
- (automatic indicating controller, selector switch with two thermocouples)
- Quick easy installation
- Low initial cost . . . low upkeep
- Top production performance with unskilled labor
- Minimum replacement down-time

Lucifer Furnaces, Inc., manufactures many standard electric heat treating furnaces and maintains a design department to create special units. For engineering assistance, parts or product information write or call . . .

LUCIFER FURNACES, INC.
Neshaminy 1, Pennsylvania
Diamond 3-0411

BY LUCIFER
FURNACES

Use postpaid card. Circle No. 321

Versatility of Grinder Produced By Grinding Head

The new Elgin ultra-universal tool and cutter grinder Model AUL 500 features a grinding wheelhead that produces a versatility said to be hitherto unknown in a tool and cutter grinder.

The machine easily handles any type reamer, tap, threading die, helicoidal drill, hob, single point turning tools, circular saws, inserted milling cutter



8" swing over the 6" x 36" table.

bits, angular cutters, gear cutters, and other type cutting tools. It can also be utilized as standard cylindrical, internal, tangential, and surface grinder.

The head spindle swivels 360° and switches easily from horizontal to vertical position. The machine comes with some 25 accessories to meet practically any tool grinding problem.

The grinder features an 8" swing over the 6" x 36" table, 20" distance between tailstocks and a 20" longitudinal travel. Cross travel is 8". Lubrication to the ways is by a one-shot system.

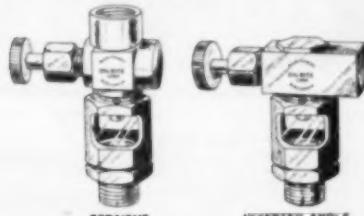
S & S Machinery Co., Brooklyn 32.
Use postpaid card. Circle No. 82

Heavy Duty Sight Feed Valves

Heavy duty sight feed valves control the dispensing of a liquid volume and visually indicate its flow in a sight

chamber. The flow volume is adjusted by a needle valve. The new line has been completely redesigned and made available in angle, cross, inverted angle, and straight patterns.

New improved features include en-



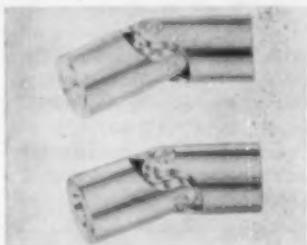
larged orifice or port, which takes care of higher flow rates. The much larger sight permits better view of the liquid flow.

This Style SFK— $\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$ pipe thread—is used principally on gravity or pressure oiling systems for bearing lubrication where considerable capaci-

ties of oil must be dispensed. Modifications are available on request.

Oil-Rite Corp., 2318 Waldo Blvd., Manitowoc, Wis.

Use postpaid card. Circle No. 83



Universal Joints In $\frac{3}{8}$ " to 2" Dia. Sizes

The most frequently used sizes of universal joints are now available in stainless steel. This includes solid or bored types in 10 sizes, $\frac{3}{8}$ " to 2" dia., and $1\frac{3}{4}$ " to 5-7/16" over-all lengths.

Boston Gear Works, Quincy 71, Mass.

Use postpaid card. Circle No. 84



One of England's Finest **LATHE CHUCKS** with average guaranteed accuracy of .002" three inches from the jaw face



3-JAW GEARED SCROLL

Size	Weight (lbs.)	Dia. of Bore	Price*
3-1/2"	8	5-9/16"	\$37.50
4-1/2"	6	1-1/8"	37.50
5-1/2"	11	1-1/2"	47.50
6-1/2"	16	1-11/16"	54.50
7-1/2"	26	2-1/4"	66.50
9"	38	2-3/4"	81.50
10-1/2"	68	3-1/2"	99.00
12"	106	3-7/8"	130.00

In Stock: Direct mounting for American long taper spindle nose.

Direct mounting camlock fitting.

Spares parts for chucks also available

* All prices f.o.b.
warehouse, N.Y.C.

Back Plates
available
at extra cost



4-JAW INDEPENDENT

Size	Weight (lbs.)	Dia. of Bore	Price*
4-1/2"	4	1"	\$27.00
6-1/2"	9	1-3/4"	31.50
8-1/2"	8	1-9/32"	27.00
9"	17	1-3/4"	32.50
10"	34	2-3/16"	56.50
12"	50	2-3/16"	74.50
14"	68	2-3/8"	88.00
16"	88	3-3/8"	101.00
	116	3-15/16"	119.00

* Light Duty

ALL IN STOCK FOR IMMEDIATE DELIVERY

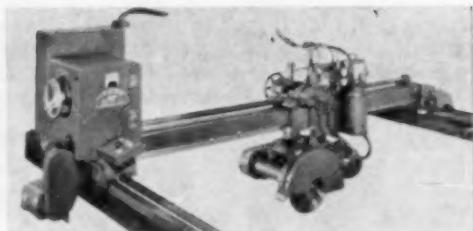
Write for complete new lathe chuck catalog

MANHATTAN SUPPLY CO., 151-A GRAND STREET, NEW YORK 13, N.Y. • CANAL 6-4992

Use postpaid card. Circle No. 322

Aluminum Plate Saw

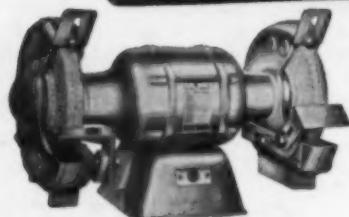
The 15 hp 111CX saw produces accurate square rectangles up to any length, to 10' wide, from aluminum stock up to 2" thick. Motor and blade arbor travel on transverse rail (which moves on two side rails). Combined with 90° swivel head, this permits trimming plates four sides without moving it. V-belt drive provides various proper speeds for different alloys. Saw has integral spray-mist cooling system.



Ty-Sa-Man Machine Co., 800 White Ave.,
Knoxville, Tenn.

Use postpaid card. Circle No. 85

MOST Value-Packed GRINDER MADE!



only \$112.00

CARBIDE TOOL GRINDER



Model 153-6". Reversible $\frac{1}{2}$ HP motor, 3450 RPM. $1\frac{1}{2}$ " wide wheels. Every part oversize for rugged, long-lasting use. Just \$201.80

BALDOR

MODEL 153-8"

Feature for feature, no other grinder offers so much for so little. Compare HP rating, wheel size, shaft diameter, bearing size with any other similar-type grinder. You'll quickly see why you get more with *Baldor*!

- Big $\frac{1}{2}$ HP motor; won't burnout even if repeatedly overloaded!
- Wide-clearance design provides maximum working room!
- Large 8" first grade wheels!
- Heavier $\frac{3}{4}$ " arbor; larger ball-bearings!
- Dynamically-balanced rotor—extra smooth operation!
- Exhaust-type guards!

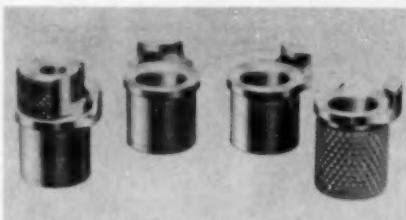
Write today for Bulletin 321N on complete line of *Baldor* Grinders and Buffers!

BALDOR ELECTRIC CO.
4353 DUNCAN AVE. ST. LOUIS 10, MO.

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Drill Bushing Lock Liners Eliminate Bushing Lock Screws

Un-A-Lok liners are said to eliminate the lock screw formerly required to secure slip renewable type drill bushings in place. The liners are provided with ground or unground outside diameters, or may be ordered with Delt-A-Liner O.D.'s for use in plastic tooling. A finger-tip twist of the bushing either locks it into the liner, or removes it for interchangeability. Layout, drilling, and tapping of lock screw holes are eliminated.



American Drill Bushing Co., 5107
Pacific Blvd., Los Angeles 58, Calif.

Use postpaid card. Circle No. 88



You can't afford it!

As the pictures show, taps cost roughly 6 times as much as drills. Yet it's common practice to resharpen the drill — and throw away the tap.

It doesn't make sense. And it's an awful waste of money.

That's where Blake comes in.

Blake makes low cost, high-precision tap grinding equipment. These easy operating tools can make your taps last up to 6 times longer . . . reduce work spoilage . . . enable taps to cut more accurately and uniformly with less strain . . . cut tap costs as much as 65%.

It's surprising how many people overlook this proven, basic method of saving money. Be sure you don't. Ask us for complete information.



Blake Chamfer Grinder/Blake Flute Grinder
used in combination, create or restore:
1. exact indexing of cutting edges.
2. controlled rake angles for each job.
3. correctly ground spiral points.
4. perfectly relieved chamfers . . .
make one tap do work of six!

EDWARD BLAKE COMPANY, INC., WATERTOWN, MASSACHUSETTS WA 6-0100



DEPARTMENT 12, 570 PLEASANT STREET,
COMPANY, INC., WATERTOWN, MASSACHUSETTS WA 6-0100



Roto-Finish Manufactures New Finishing Machine

The Roto-Finish Co., 3700 Milham Rd., P.O. Box 988, Kalamazoo, Mich. has been appointed manufacturing licensee of the new "Harperizer" fin-

ishing machine. The machine is designed to produce a finish equal or superior to buffing on parts with intricate detail, ornamentation, or complex shape. Using a fine loose abrasive, the Harperizer utilizes a high centrifugal force which holds parts and media together in a tight mass. Processing time is short. No fixtures or buffs are necessary.

Parts which can be processed in the machine range from watch screws to automobile headlamps. The rate of production is high on such parts as cams (from 80 to 18 micro-inch finish without distortion).

A Harperizer is now being installed in the Roto-Finish finishing laboratory in Kalamazoo for demonstration and sample processing.

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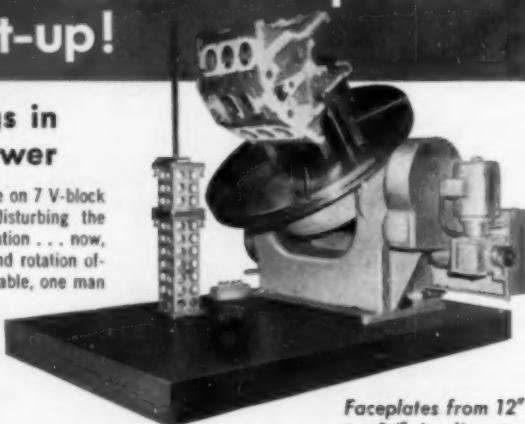
Lubricant Coating Applied Without Surface Pre-Treatment

From 100% to 300% increased tool life has been reported from Europe through the use of Molykote PVE, a bonded

Dimensional check on 7 planes in one set-up!

Up to 50% savings in time and manpower

Every angle, diameter, line, critical surface on 7 V-block planes is completely checked without disturbing the initial set-up. Previously a two-man operation . . . now, with motor-powered, push-button tilting and rotation offered by the ROTAB precision positioning table, one man quickly, accurately runs the entire inspection in about half the time. This is how ROTAB is paying off for a major diesel engine manufacturer . . . ROTAB will pay off for you, too. Write for details.



Faceplates from 12"
to 84" in diameter

MACHINE PRODUCTS Corporation

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MACHINE and TOOL BLUE BOOK



lubricant coating for ferrous surfaces. It requires neither chemical nor mechanical surface pre-treatment. Applied with a paint spray gun, the coating dries in air at room temperatures. Among the tools which have been successfully treated for longer cutting life are twist drills, reamers, broaches, gear cutters, and bending tools.

The Alpha-Molykote Corp., 65 Harvard Ave., Stamford, Conn.

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"Raymac"

SOLID CARBIDE CUTTING TOOLS

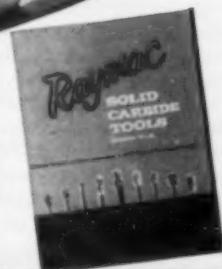


- MIDGET BURRS • ROTARY FILES
- DRILLS • REAMERS • END MILLS
- COUNTERSINKS • GRINDING
TOOLS AND OTHER SPECIAL TOOLS

*Up to 25%
Longer Life*

Finest quality solid carbide ground and lapped to the sharpest cutting edges make "Raymac" tools the quality standard of the industry. More parts produced per tool and per regrind.

Make "Raymac"
your standard.



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CATALOG
NO. 61



"Raymac" Division - DEXCO CORPORATION

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Detroit 39, Michigan

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- BENCH
- PEDESTAL

Queen City HEAVY DUTY

• GRINDERS • DISC GRINDERS and BUFFERS
We know what goes into these Grinders and Buffers! That's why we can make this offer.

Point for point - you just can't beat QUEEN CITY Heavy Duty Disc Grinders and Buffers. Built to stand up under hardest use . . . heavy duty motors deliver full horsepower. Wheels, guards, switches, cords, eyeshields are of highest quality . . . selected to deliver long, trouble-free service.

Choose from a complete line of floor or bench types . . . in sizes from $\frac{1}{2}$ to 10 H.P. and buy them for 20 to 30% under competing makes. Try them for 30 days on money-back guarantee!

**QUEEN CITY
MACHINE TOOLS**

write for
FREE CATALOG
TODAY!

3912 KELLOGG AVE.
Cincinnati 26, Ohio

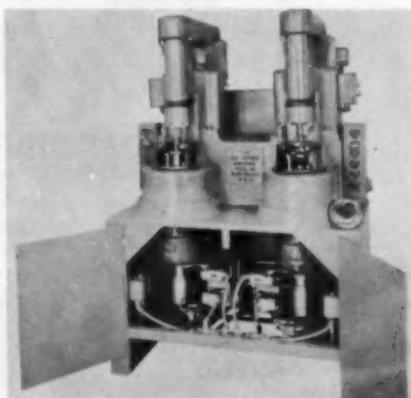
"Known for Quality for Over 50 Years"

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Milling Machine Automatically Mills Circular Grooves

A completely new duplex vertical precision U.S. Half-Mill, for high production rotary milling operations, is designed to mill circular grooves to preplanned tapered depths in the production of pump units for automatic transmissions.

Two parts are automatically processed at one time. Operator places them on the two tables and presses the start button. The workpieces are held in the centers of the independently powered



rotary tables by means of air actuated "elevator type" clamps. The tables rise until the parts hit locators and start the automatic cycle. Release at completion of cycle is also automatic, after the clamp descends with the part.

The power feed rotary tables revolve at the rate of 2 rpm. As each part rotates, the cutter, a carbide end mill, rises and falls, thereby milling oil grooves, the critical depth and contour of which are accurately controlled.

Both spindles are powered by independent motors with flat belt drives producing a fixed speed of 6000 rpm.

U.S. Burke Machine Tool Co., Brotherton Rd at Pennsylvania R.R., Cincinnati 27, Ohio.

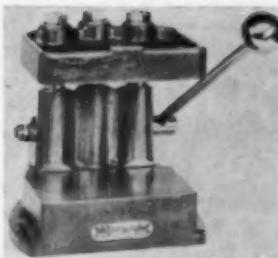
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New Jig Size Added

A new size has been added to the three post Cone-Lok Jig Style No. 1 series. Two models are available in 15 sq. in. work area jigs, one with shut height of 3" and another with 5" shut height. Model numbers are FC-1533 and FC-1535 respectively.

With this addition to the Style No. 1 series, the company now can supply jigs from stock in work area sizes from 2 sq. in. to 48 sq. in.

N. A. Woodworth Co., 1300 E. 9 Mile



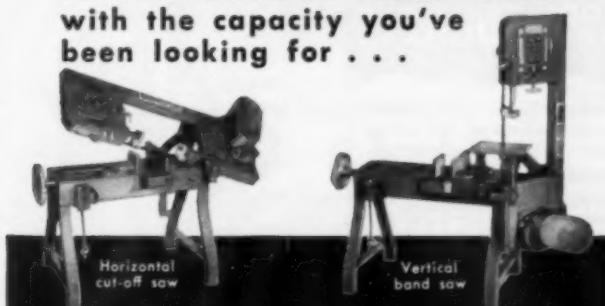
Rd., Detroit 20, Mich.

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The New WELLS MODEL 58-B

A CONVERTIBLE BAND SAW

with the capacity you've
been looking for . . .



COMPACTLY BUILT • MODESTLY PRICED

Here's the all new Wells Model 58-B . . . a metal saw designed and built for double duty—double value. It's a compact, rugged, well guarded, extremely versatile unit . . . economically priced. As a horizontal cut-off saw, Model 58-B features quick-action vise (swivels to 45°); automatic shut-off; adjustable guides. Capacity: 6" x 10" rectangular shapes; 6" dia. rounds. For vertical use, swing head to upright position and install work table. Optional wheel-handle unit provides complete mobility. Write for complete information.

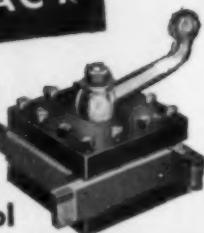


707 Coolidge Ave., Three Rivers, Mich.

Use postpaid card. Circle No. 328

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ACCURACY.

**Here's Real
Precision
Plus
Multiple Tool
Efficiency**



ENCO TOOL POST TURRETS

Boost lathe production, cut costs, reduce tool switching and re-checking, cut set-up time, with ENCO 12-station tool post turrets! Holds 4 maximum size tools . . . 3 working positions each. Sturdy and rigid for hogging cuts, yet unsurpassed for close-tolerance work.

ON-THE-BALL
RE-INDEXING

Spring loaded balls locked between perfectly milled spherical seats provide consistent re-indexing accuracy. "On the ball" every time!

There's an ENCO turret for every lathe.

Mail coupon for cat. #53 and name of nearest Enco Franchise Dealer.

ENCO Mfg. Co.
4520 W. Fullerton
Chicago 39

ENCO Manufacturing Co.
4520 W. Fullerton,
Chicago 39. Dept. 2120

Please send catalog #53 and full details of
ENCO 12-station tool post turrets.

Name _____

Firm _____

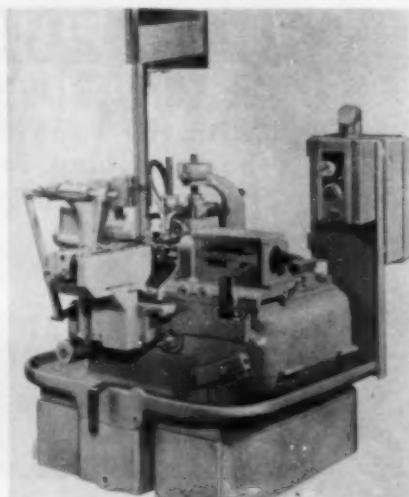
Address _____

Use postpaid card. Circle No. 329

More Than 1000 Small Gears Produced Per Hour With Unit

A new gear hobbing machine, with shuttle-type loading and complete automation, has speeds up to 4084 rpm for fast, high-volume production of small, fine-pitch instrument gears. It is reported that the No. 1½ can perform all handling and hobbing operations on small spur gears, pinions, and special tooth forms at rates higher than 1000 per hour.

The new hobbing machine is equipped



with antifriction workslide and hob spindle. All shafts run in needle bearings. Accurate tooth forms can be produced in seconds, hobbing brass, aluminum, phenolic, and other materials in the same machinability range. Automatic cycle can include feeding, holding, clamping, driving, hobbing, deburring, and ejecting.

Precision adjustments are provided for shifting and setting the hob. Maximum work capacity is 1" dia. by 1/2" face, from 24 DP in brass and 36 DP in steel.

Barber-Colman Co., 593 Loomis St., Rockford, Ill.

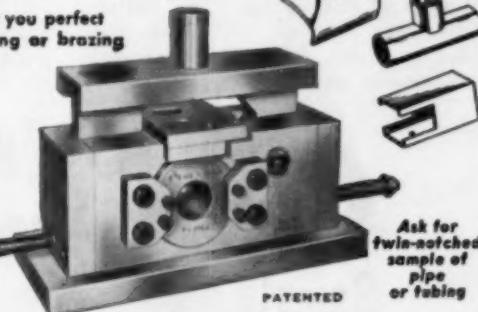
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the
ARC-TWIN Cuts Two Perfect Notches
 in One Downstroke of Press!

SAVING both time and cost, it gives you perfect T-joints — instantly ready for welding or brazing without deformation or finishing!

Twin-acting punch shears clean, from inside out, leaving two matching notches (in perfect 180° alignment) with every downstroke of the punch press. Quickly interchangeable dies and punches accommodate pipe and tubing from $\frac{1}{2}$ " to $2\frac{1}{8}$ " O.D.; special units, up to 3" O.D.

Special Arc-Twins for double notching stainless steel or monel metal and units built to your specifications can also be furnished.



Ask for
 twin-notched
 sample of
 pipe
 or tubing

PATENTED

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 Stone Park, Illinois

VOGEL

TOOL AND DIE CORPORATION

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ALLEN Heavy Duty PUNCH PRESSES

Model BT-25
 25 Ton—\$1007.50
 less motor—fob



Model BT-12
 12 Ton—\$437.50
 less motor—fob



Model BT-8
 8 Ton—\$347.50
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Model BT-5
 5 Ton
 \$199.50
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Model B-2—2-Ton
 \$87.50
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**Powerful
 Dependable
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Hundreds of different
 Model Combinations
 1 to 25 ton Capacities
 Moderate in price

See your Supply Dealer or
 write for catalog giving com-
 plete information, specifi-
 cations and prices on our line
 of Heavy Duty Punch Presses.

Thousands in Use the World Over

ALVA ALLEN INDUSTRIES, Dept. MTB

Clinton, Missouri · Tel. TURNer 5-3331

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Resin Bonded Wheel For Faster Grinding, Finer Finishes

The resin bonding material of the new A.I.T. Forty-Niner Golden Wheel was formulated through scientific engineering, incorporating fast grinding to assure an absolute path of stock removal with every traverse. The manufacturer reports that in tests, the wheel has offered finer finishes due to its cool grinding under dry conditions, with high tensile strength assuring longer

life. Also, the new "gold appearing" body consists of material which resists expansion and holds the diamond impregnated bond rigidly.

The new wheel is available in 50, 75, or 100 concentration, depending on the user's needs. On any application, wet or dry, the new diamond wheel is said to excel. Choice of grit sizes in diamond impregnation is up to the customer.

A.I.T. Diamond Tool Co., 8221 North Kimball Ave., Skokie, Ill.

Use postpaid card. Circle No. 92



Industry's NEWEST Production TOOL

MOLYKOTE® G LUBRICANT

- ALMOST 100% SAFETY AGAINST GALLING AND SEIZING WITH ALL BEARING METAL COMBINATIONS
- ELIMINATES STICK-SLIP, METAL PICK-UP AND DISTORTION IN PRESS FITTING
- REDUCES WEAR-IN TIME AND DAMAGE IN NEW OR REBUILT MACHINERY
- THE HIGHER THE LOADS, THE GREATER THE MARGIN OF SUPERIORITY OF MOLYKOTE G

Write for your free sample of MOLYKOTE G LUBRICANT today. We will also send you a copy of our new Bulletin 126 which gives complete details. THE ALPHA-MOLYKOTE CORPORATION, 65 Harvard Avenue, Stamford, Conn. Phone Fireside 8-3724. Plants in Stamford, Conn., Munich, Germany and Strasbourg, France.

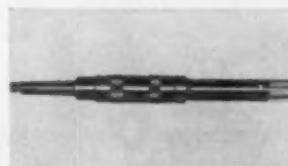
THE ALPHA-MOLYKOTE CORP. 65 Harvard Ave., Stamford, Conn.	MTBB-12
Please send me a free sample of your MOLYKOTE G Lubricant.	
NAME _____	
COMPANY _____	
ADDRESS _____	
CITY _____	ZONE _____ STATE _____



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Tool Improves Surface Finish, Minimizes Parts Preparation

The Roll-A-Finishing tool is said to improve surface characteristics by as much as 100 times. It's an offshoot of Cogsdill's bearingizing process, called Roll-A-Finishing. This process is reported to reduce .80 to 200 micro-inch surfaces to $\pm .0002$ to $\pm .0025$ tolerances and 2 to 10 micro-inch finishes. Parts preparation is minimized since holes may be rough-bored to tolerances up to .005 before processing.

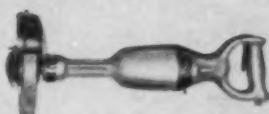


A range of standard sizes from $\frac{1}{2}$ " to 2" dia. will be available; other sizes to production specifications.

Cogsdill Tool Products, Inc., 12980 W. Eight Mile Rd., Oak Park 37, Mich.

Use postpaid card. Circle No. 200

WILSON PORTABLE PNEUMATIC TOOLS



HORIZONTAL GRINDERS



DIE GRINDERS



VERTICAL GRINDERS



DRILLS

Lightweight • Powerful • Compact

All Wilson portable pneumatic production tools are designed for easy handling. These lightweight, compact tools are production time savers on a wide range of work. Catalog PT-58 gives all the facts. Write for your copy.

THOMAS C. WILSON, INC.

21-11 44th Avenue, Long Island City 1, New York

BETTER TOOLS FOR BETTER WORK

TW306

Use postpaid card. Circle No. 333

December, 1960

211

Cooley

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HEAT TREATING

FURNACES

41 Models—with and without

Controlled Atmosphere

**RECIRCULATING
OVENS**

for drying, baking, etc. 3 Types—
 650° F., 850° F., and 1000° F. Wide
range of sizes.



**INDUSTRIAL BOX
FURNACE**

for general heat
treating to 2000° F.
Highly efficient
with low mainte-
nance; quick repair
with small down
time; sturdy; re-
liable.



WRITE for
complete information on these and the

- New GA Atmosphere Box Furnace
- Recirculating Air Draw
- Bench Types
- 2500° F Box Furnace

Cooley

ELECTRIC MFG. CORP.

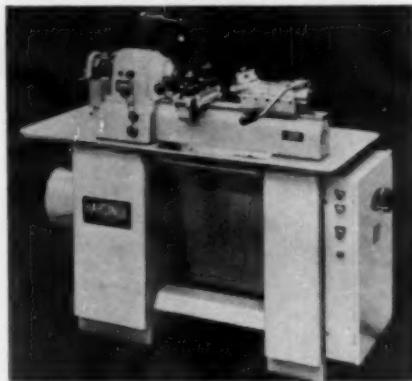
36 S. SHELBY ST.
INDIANAPOLIS 7, INDIANA

Use postpaid card. Circle No. 334

Second Operation Machine

A new super-precision second operation machine, Model DSM59-R, provides $1\frac{1}{16}$ " round collet capacity through the spindle, step chuck capacity to 6", swing over bed 9" dia. Spindle speeds are to 4,000 rpm. The spindle takes a full range of standard tooling, 5C Hardinge collets, step chucks, jaw chucks, and face plates.

New features include electric production drive, preloaded precision ball



$1\frac{1}{16}$ " round collet capacity through the
spindle, step chuck capacity to 6", swing
over bed 9" dia.

bearings, electric interlock for spindle
lock pin, coolant facilities with self-
draining pan.

The headstock is aligned to the dove-
tail bed section to master gages assur-
ing interchangeability of a wide range
of bed attachments. The double tool
cross slide takes standard tooling ac-
cessories for forming, cutting off, fac-
ing and taper turning.

Hardinge Brothers, Inc., 1420 College
Ave., Elmira, N.Y.

Use postpaid card. Circle No. 94

**Wire-Straightening-Cutting Unit
Handles $1/16$ " to $1/8$ " Dia. Wire**

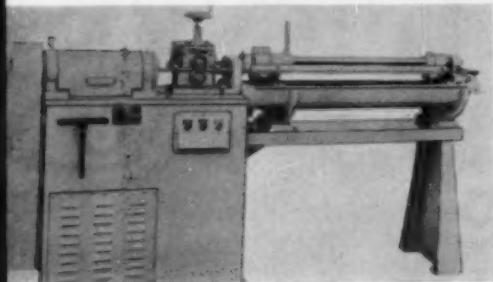
The new Shuster 1V18 variable speed
automatic wire straightening and cut-
ting machine handles wire ranging from
 $1/16$ " to $1/8$ " dia. Features include high
speed straightening arbor, with five
elongated split-dies, mounted on ball

Gaertner Optical Instrumentation
designed and manufactured in the U.S.A.

bearings; Reeves variable speed unit for infinite feed ranges from 25 to 150 fpm; angled electric control panel for one-position operation, etc. These new models are arranged for high speed cutting—200 cuts per minute, up to 8".

Two standard models are offered, which include a model that is a constant speed machine geared to feed up to 125 fpm.

The company also manufactures machines of this type for special applications, such as special speeds and ca-



Machine features Reeves variable speed unit for infinite feed ranges, 25-150 fpm.

pacities for heat treating, with feeds for press operations, etc. There are 51 Shuster models of wire straightening components and straightening and cutting machines from .020" to 11/16" capacities, as well as four models of the Shuster 5/16" cold thread rolling machine.

Mettler Machine Tool Inc., Boulevard Industrial Park, New Haven 4, Conn.
Use postpaid card. Circle No. 95



Make 3 hammers AT ONCE!

It's the NEW, easy, economical, quick way to mold your own lead hammers on a production basis with "SHUR-GRIP" handles and this COOK production mold.

Write for circular and prices

COOK LEAD HAMMER SERVICE
67 MASSASOIT AVE., EAST PROVIDENCE, R. I.
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Gaertner 2" x 4" toolmaker's microscope for measurement to 0.0001" and 1 minute of arc

You'll find the Gaertner Toolmaker's Microscope as part of the standard inspection equipment in the ideally-equipped shop or lab. It will do the work of many single-purpose measuring and inspection instruments with greater convenience and accuracy.

Full 2" precision lead screws permit measurements over 2" x 2" of the instrument's range without the use of gage blocks or rods.

Independent and combined rotation of the cross hairs in the protractor ocular speed up measurements and simplify measuring procedure. The instrument's versatility may be increased through the addition of such accessories as thread and radius templates, camera and spotting attachments, fine motion focus, direct-reading counters, and interchangeable optics for varying magnification and field.

Write for Bulletin 147-56

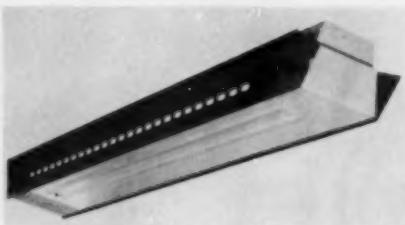
Use Postpaid Card, Circle No. 336

1221 Wrightwood Ave., Chicago 14, Ill., BU 1-5335

Gaertner
SCIENTIFIC CORPORATION

Comfort Heaters For Machine Shops

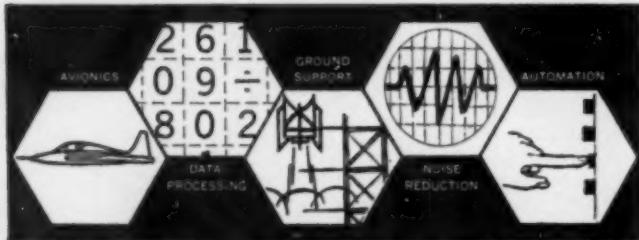
A new line of electric infrared Comfort Heaters has been designed for creating comfortable working conditions in inadequately heated or poorly insulated machine, tool, and production shops. Personnel are kept warm and comfortable even during the coldest weather. Since the heaters transfer radiant energy directly from source to object without costly heating of the intervening air, they are ideal for areas where large air movements make con-



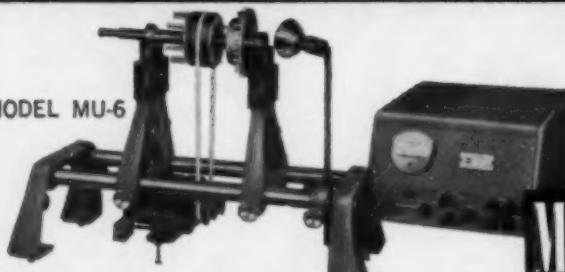
SUPER SENSITIVE MU-6

takes the mystery out of
dynamic balancing

- High precision at no extra cost
- Sensitive to one micro-inch
- Balances over wide speed range
- Rotor weights up to 100 lbs.
- Use to balance-test rotors, impellers, armatures, drums, etc.



MODEL MU-6



For further information write to—
MICRO BALANCING INC., Herricks Rd., Garden City Park, L. I., N.Y.
West Coast Representatives: **Electronic Balancing Co., Long Beach, California**

Use postpaid card. Circle No. 337

MACHINE and TOOL BLUE BOOK

ventional space heating costly or ineffective, for areas where only occasional heating is needed, or for localized heating. The heater can also be mounted overhead.

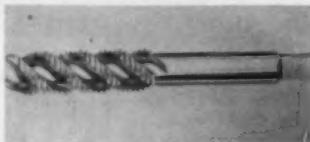
Known as Series CH, the heaters are available in various models for use with the firm's linear quartz tubes or with standard high temperature T-3 linear quartz lamps.

Fostoria Corp., Fostoria, Ohio.

Use postpaid card. Circle No. 96

High Helix Taps For Use on Space Age Metals

A new line of taps, designed especially for precision tapping of the newly



developed difficult-to-machine materials, has been introduced. Known as



No. 9180 Toolmaker's Knee, 3" x 2½" x 4"



No. 9181-20
Duplex Angle Iron, 12" x 6" x 6"



No. 9192 Universal Right Angle Iron, 5" x 4½" x 8"



No. 9201 Measuring Iron, 6" x 2½" x 12½"

ANGLE IRONS with 6 precise Working Faces

All faces are precision ground square or parallel within *tenths*. Clamp work to any face for multiple machining and inspection set-ups without relocating work. Add locating pins, stops, keyways, clamps and you have quickly-built special work staging fixtures.

Complete range of standard sizes available from stock. Special extra-large sizes to order from stock patterns. Write for Catalog 511.

TAKE IT TO

TAFT-PEIRCE



7 MECHANIC AVENUE, WOONSOCKET, RHODE ISLAND

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**PANNIER RAP-IT-SAFE
CUTS STAMPING TIME 50%**

The Pannier Rap-it-safe style single stamp holder cuts stamping time at least 50%... while eliminating hand and finger injuries to the stamper. The holder keeps the worker's hand safely out of range of the hammer blow. The built-in guard gives added protection.

The Pannier Rap-it-safe holder is designed for fast, accurate heavy-duty stamping of steel boilers, tanks, plates or other products requiring multicharacter legends. Up to 13 characters per minute can be stamped accurately, depending on the operator. The letters and figures, available in various sizes, are kept in the Pannier Stamp Rack, which has room for 40 characters. For further information, write:



Pannier Rap-it-safe holder operates simply and effectively, permitting clearer, more legible impressions.



Stamp Rack holds stamps separate and easily identifiable in individual slots, convenient and ready to use.

PANNIER MASTER MARKERS

203 Pannier Bldg., Pittsburgh 12, Pa.
Use postpaid card. Circle No. 339

**Cut Cutting Costs
KELLER POWER HACK SAWS
5 SIZES . . . 10 MODELS**



F.O.B.
\$495.00
Eau Claire, Wis.

CONTROLLED FEED PRESSURE. 40 to 170 lbs., two speeds and automatic lift on return stroke gives you faster cutting, longer blade life. Rugged, Oilitite bearings throughout, 45° swivel vise and other features. Ask your Industrial Distributor about KELLER Power Hackaws or write for Bulletin 300 with prices.

KELLER DIV.

Sales Service Mfg. Co.

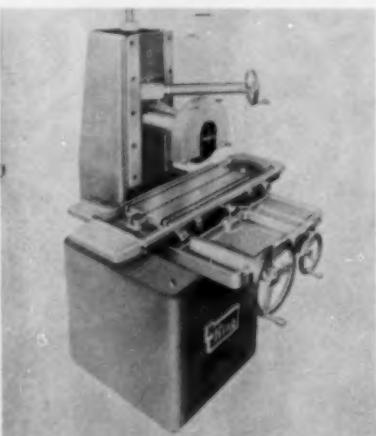
2361 University Ave. St. Paul 14B, Minnesota
Use postpaid card. Circle No. 340

Hi-Helix, the line features efficient removal of chips and eliminates broken taps caused by clogged flutes. It is reported that the new tap will make smooth, accurate threads to the most exacting tolerance—even in deep holes interrupted by slots or keyways.

Taps are available in all regular sizes from No. 3 through $\frac{1}{2}$ ".

Morse Twist Drill and Machine Co., New Bedford, Mass.

Use postpaid card. Circle No. 97



**Manual-Control Surface Grinder
20" Table Travel, 14" Cross Fd.**

For either wet or dry grinding, the model K-1020 manual-control surface grinder has a longitudinal table travel of 20" and a 14" cross feed. Grinding wheel diameter of 12" allows a 15" vertical clearance over the table. The tee-slotted table travels on precision ground ways and has adjustable table stops. It features a 10"x20" working surface when used for wet grinding.

The King grinder has a direct-drive spindle, rotating on pre-loaded precision ball bearings, powered by a 1½ h.p. balanced motor. Magnetic chucks and other accessories are also available.

King Machine & Mfg. Co., 1171 East 32nd St., Los Angeles 11, Calif.

Use postpaid card. Circle No. 98

Toggle Clamp Display Kit

Now purchasing agents, tool engineers, and others interested in the application-evaluation and quality construction of an entire line of toggle clamps can do so quickly and easily, right at their desks, with a new sales tool now in the hands of Detroit Stamping Co. distributors. The kit includes the full line of miniature plunger, vertical, horizontal, and portable toggle



clamps, useful for light assembly work and other light-duty holding operations. The 4½ lb. case measures 15" x 12" and is only 5" deep.

Detroit Stamping Co., 340 Midland Ave., Detroit 3, Mich.

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"If you happen to find a pink slip in your pay envelope, Chip, it didn't get there by mistake."

PRODUCTION MEN

send for this

FREE BROCHURE

TODAY!

INSURE TOP METALWORKING PERFORMANCE



CMD Anti-Scoring LUBRICANT

HIGH PRESSURE NON-SEIZING

Increase your production with fewer rejects and longer runs. Users report savings up to 81% over conventional lubricants.

Cams	Thrust bearings	Grinding centers
Gear cutting	Broaching	Milling machines
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CHICAGO MANUFACTURING & DISTRIBUTING CO.

1906 West 46th St., Chicago 9, Illinois
Use postpaid card. Circle No. 341

INSTANT KEYWAYS



for a penny a piece

With Minute Man Keyway Broach Kits you can cut keyways in one minute for as little as one cent. For keyways from $\frac{1}{16}$ " to 1" in any bore from $\frac{1}{4}$ " to 3".

SAVE TIME WITH THESE OTHER STANDARD STOCK BROACHES

Minute Man®

SQUARE BROACHES $\frac{1}{8}$ " to $\frac{3}{8}$ " holes



HEXAGON BROACHES $\frac{1}{8}$ " to $\frac{3}{8}$ " holes



ROUND BROACHES $\frac{1}{4}$ " to 1" hole

**SEND FOR CATALOG
AND PRICE LIST**

**The duMont Corp.,
Greenfield, Mass.**

MAIL FREE BROACH CATALOG AND PRICE LIST F describing Square Broaches, Hexagon Broaches, Production Type Keyway Broaches and Keyway Broach Kits to

Name

Company

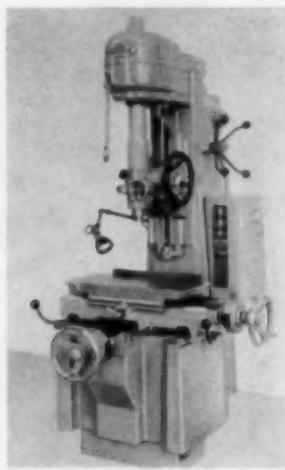
Address



duMONT

Use postpaid card. Circle No. 342

218



New Jig Borers Offer Greater Range, Larger Table

A new, popular-priced jig borer, combining the advantages of the Moore Model No. 1 and Model No. 3 jig borers, is announced by Moore Special Tool Company, Inc., 800 Union Avenue, Bridgeport 7, Conn. As a result, Moore now offers two jig borer models—the No. 1½ and No. 3. Designed for working to split-tenth tolerances, this new No. 1½ Moore jig borer offers a greater range and larger table—10½" x 19½"—than its No. 1 predecessor, which was discontinued in 1955.

A special 3-position clutch ("start", "indicate" and "brake"), conveniently accessible for easy control by the operator, is one of the outstanding features of this new jig borer. In addition, 14 "plus" features, not found in the preceding model, make this popular-priced machine extremely accurate and outstanding in performance: closer tolerances, infinitely variable spindle speeds, 120 to 2400 rpm, vee and flat ways, the elimination of gibs and overhang, a table 10½" x 19½" x 16" height, etc.

Use postpaid card. Circle No. 100

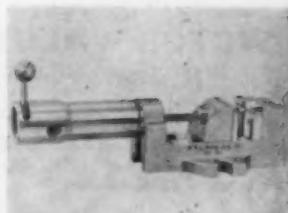
MACHINE and TOOL BLUE BOOK

Air Vise Speeds Light Drilling

To answer the problem of speeding up light drilling, tapping, and assembly work, a new Palmgren air vise, Model No. 121, has been designed. The vise has a jaw width of 1½"; jaw opening, 1½"; jaw depth, 1". It is 1¾" high over-all; vise and cylinder is 8" long over-all. Unit is equipped with a 1½" dia. stainless steel air cylinder with adjustable stroke. Any available air supply will operate vise.

Chicago Tool & Engineering Co., 8383 S. Chicago Ave., Chicago 17, Ill.

Use postpaid card. Circle No. 101



Vise has jaw width, 1½"; jaw opening, 1½"; and jaw depth, 1".



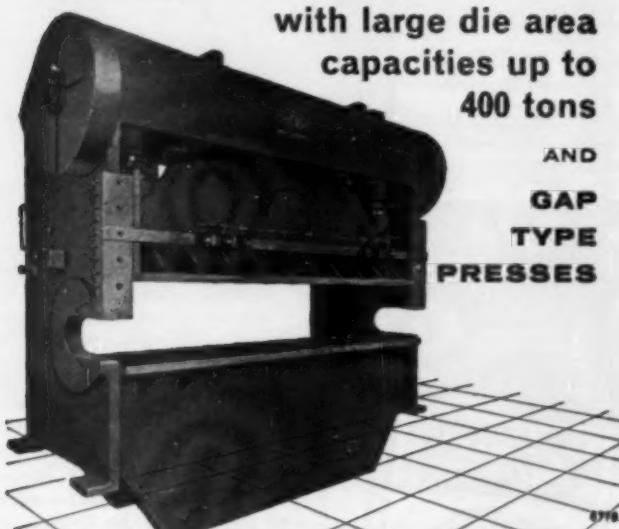
PRESSES

STRAIGHT-SIDE TYPE

with large die area
capacities up to
400 tons

AND

GAP
TYPE
PRESSES



Complete recommendations for any job on request



Press Brakes • Straight-Side-Type Presses • Press Brake Dies

Hand and Power Bending Brakes • Special Metal-Forming Machines

DREIS & KRUMP
MANUFACTURING CO.

7440 South Leomis Boulevard, Chicago 36, Illinois

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Another

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TOP QUALITY—LOWEST PRICES

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DIAMOND WHEEL DRESSERS

Made of selected, full individual stones, mounted in 7/16" diameter x 6" long cold rolled shank.

Karat	Regular Price	Our New Price
1/4	\$ 6.00	\$ 2.85
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1	30.00	10.25
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2	75.00	20.00
2 1/2	102.00	26.00
3	130.00	32.00

These diamonds can be set in any shank to your specifications for \$1.00 each extra.

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Dealers In Tool Room Equipment

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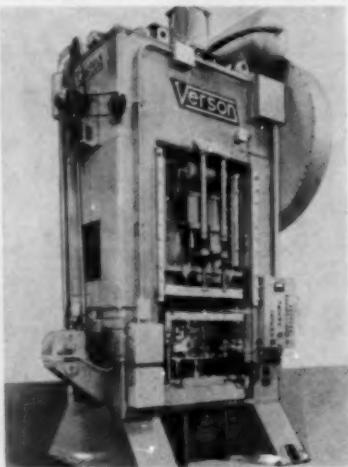
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220

Double Transfer Feed Combined W/Impact Machining

A double transfer feed mechanism has been applied to a cold extrusion press. Developed to produce automotive wrist pins, the press feeds slugs from a single hopper to two Verson Transmat feed mechanisms. In parallel transfer operations, the material is moved to each station by mechanical fingers.

Starting with a pre-coated slug .941"



300 ton Verson impact machining (cold extrusion) press equipped with two Transmat transfer feed mechanisms to produce two automotive wrist pins simultaneously.

in diameter by 1 3/8" long, the material is checked for size in the first station. It is extruded at the second station. The third station performs draw-wipe and pierce, and the finished part is unloaded through the bottom of the die. The finished wrist pin has an O.D. of .866", I.D. of .541", and a length of 2.795".

Verson Allsteel Press Co., 9300 S. Kenwood Ave., Chicago 19.

Use postpaid card. Circle No. 102

Redesigned Air Tool For Greater High Speed Strength

Bigger bearings and larger rotor shaft are two of many construction improve-

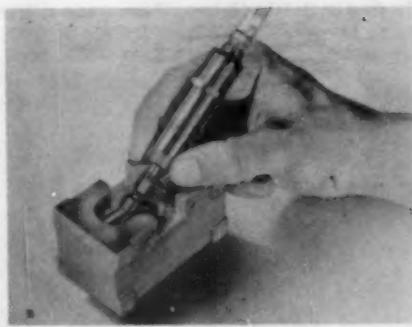
MACHINE and TOOL BLUE BOOK

ments made in the 14G-800 Series Mini Grinder.

The one-piece steel motor housing and ring throttle provides greater strength and durability. Despite these and other changes, the grinder remains one of the smallest for tool room and production work—weighing only 5 oz., and measuring 13/16" d. by 3-7/8" long, with 13/32" offset.

Buckeye Tools Corp., 5003 Springboro Pike, Dayton 1, Ohio.

Use postpaid card. Circle No. 103



UNISORB

MODERN 3-IN-1 MACHINE MOUNT

- VIBRATION CONTROL
- LOW COST INSTALLATION
- PRECISION LEVELING

A detailed technical illustration of a Unisorb machine mount. It features a rectangular base plate with two thick, cylindrical rubber pads attached vertically. A central threaded bolt passes through the base plate and the top of the rubber pads. The entire assembly is shown from a slightly elevated angle, highlighting its three-in-one functionality for vibration control, leveling, and installation.

A complete line of Unisorb Pads and Unisorb Level-Rite Mounts for fast and simplified installation of all types of machinery and equipment.

- Cuts installation costs up to 70% . . . eliminates bolts and lag screws . . . speeds installation . . . no drilling required . . . machines can always be moved quickly.
- Eliminates up to 85% of transmitted vibration and noise . . . increases machine life and efficiency . . . reduces maintenance.
- Unisorb Level-Rite provides fast and precise leveling.
- Safe, sure grip . . . can be cemented if needed.
- Unisorb is available in wide variety of densities and thicknesses — for maximum efficiency. Send for bulletin, today.

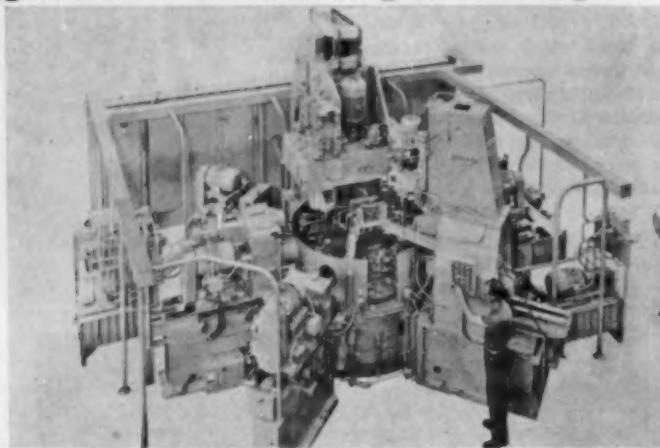
PED-64

UNISORB

203 SOUTH STREET
BOSTON, MASS.

Use postpaid card. Circle No. 346

Indexing Machine Processes Steering Gear Housings



Greenlee Bros. & Co. announces delivery of an eight-way, eight-station, horizontal and vertical automatic indexing machine to process aluminum steering gear housings. The machine produces 153 housings per hour performing

"ruff" and semi-finish boring, generating, drilling, counter-sinking, tapping and cross-facing operations.

The 52" diameter table is automatically indexed.

"Ruff" castings are located on three

NUMBERALL

GIVES THE COST OF STAMPING NUMBERS



numbering heads, non-automatic, with quick-set wheels. Write for catalogs BB-80, B-83 and BB-95.

Steel Type and Wheels Available with Round Face Characters.

NEW MODEL 70 MULTI-WHEEL NUMBERING MACHINE

The most efficient method of stamping numbers into metal. Repeats the same numbers until changed. Model 70 NUMBERALL machines are used in all industries to mark various parts. Stamps numbers, etc., quickly . . . neatly. Much better marks are produced by these machines than by single stamps or steel type, and at a far lower cost. Shank for Hand or Press and with any number of wheels from 3 to 20. Can be furnished in $1/32"$ to $3/8"$ high figures, sharp face gothic or shaded roman style. Write for Bulletin BB-70. We also make other



Hand shank Model 70 illustrated.
Press shank for foot or power presses
also available.

NUMBERALL STAMP & TOOL CO.
HUGUENOT PARK STATEN ISLAND 12, N. Y.

Use postpaid card. Circle No. 347

cast lugs and power-clamped by a tunnel-type column through which a horizontal tap unit traverses.

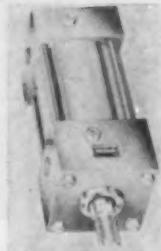
The multiple spindle heads were designed to accommodate change gears in order to vary spindle speeds. The complete coolant system provides also for disposal of aluminum chips.

Greenlee Bros. & Co., 2136—12th St., Rockford, Ill.

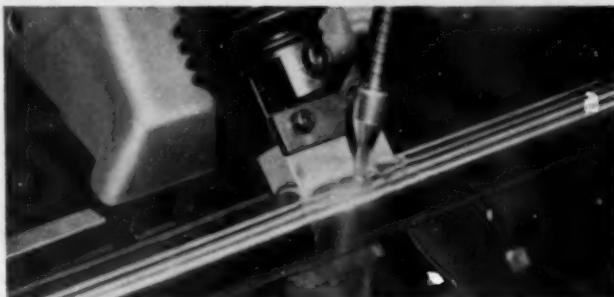
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Improved Cylinders For Air/Oil Use

Newly improved Series A cylinders can be used without modification in either air or hydraulic systems. Cylinder incorporates newly developed reverse trim packings and multiple-lip rod wiper



MICROSTONING



New! SUPFINA Produces revolutionary $\frac{\text{controlled}}{\text{microinch}}$ Surface Finish!

Microstoning, by Taft-Peirce/Supfina, is an abrasive final finishing process that generates an ultra-fine, controlled microinch finish. It removes grinding flats, feed spirals and corrects geometrical errors — all at the same time.

Taft-Peirce/Supfina attachments set up quickly and easily on lathes and other machine tools. They are completely portable and no special skills are needed to operate.

Many opportunities for finishing short-cuts: elimination of surface grinding, salvaging of rejects, out-of-roundness correction. Supfina does its job extremely fast and desired finish is attained in a matter of minutes.

Save with Microstoning! Whatever your present finishing system, look into Taft-Peirce/Supfina Microstoning. Send for complete details, now!

Finish it with



TAFT-PEIRCE

SUPFINA

7 MECHANIC AVE., WOONSOCKET, R. I.

TPB-25

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**Want to save
TOOL ROOM HOURS?**

...then buy

kipp

AIR GRINDERS

MODEL JA
50,000 RPM

\$60.00

IN U.S.A.



Weight, 12 ounces;
length, 6½ inches;
chuck size ½ inch.
Wheel guard removed.
for better illustration.

Here is a fast approach to saving valuable tool room hours. Designed by toolmakers for toolmakers, this reliable off-hand grinder is still the top drawer tool in thousands of tool rooms everywhere.

FREE GRINDING WHEEL CHART

Included with Kipp Air Tool Catalog AT-3007. Your copy will be mailed promptly at your request.

kipp

MADISON-KIPP CORP.

207 Waubesa St., Madison 10, Wis., U.S.A.

Use postpaid card. Circle No. 349

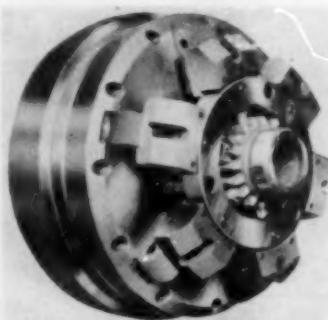
224

that cleans in two directions to deliver a dry rod on the outstroke. The interchangeable cylinder can be used for all types of industrial applications at pressures up to 200 psi air, 500 psi oil or water.

Eleven bore sizes from 1½" through 14" are available, and 21 different mounting styles.

The S-P Manufacturing Corp., 30201 Aurora Rd., Cleveland 39, Ohio.

Use postpaid card. Circle No. 185



The chuck holds the part at the pitch line of gear for averaging out errors in previous operations.

Air, Drawbar or Manually Operated Gear Chucks

A line of spring-jaw type gear chucks, either air, drawbar or manually operated, is announced by Erickson Tool Co. Main features claimed for the gear chucks are their universality and their design for accurate holding of the part from the pitch line of the gear.

With automatically self-compensating spring jaws, the gear chuck jaws operate independently, thus giving accurate location from all segments even though an out-of-round condition might have been caused during prior heat-treating or machining. The same chuck will handle a wide variety of gears.

Erickson Tool Co., 34350 Solon Rd., Solon, Ohio.

Use postpaid card. Circle No. 199

MACHINE AND TOOL BLUE BOOK

GRIND: RADIUS-ANGLE QUICKLY — on your SURFACE GRINDER — EASILY

RADIUS DRESSER \$44.00

Diamond \$8.00



Chatter Resistant, Spring Loaded Spindle

Hardened shaft-bearing adjustable for wear. Diamond always perfectly centered. Easily set adjustable 180° stops. All surfaces ground true from hole. CAPACITY— $1\frac{1}{2}$ " Convex to 4" concave

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CHATTER RESISTANT,
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DUST SEALED, HARD-
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PRECISION REMOVABLE ANGLE PLATE,
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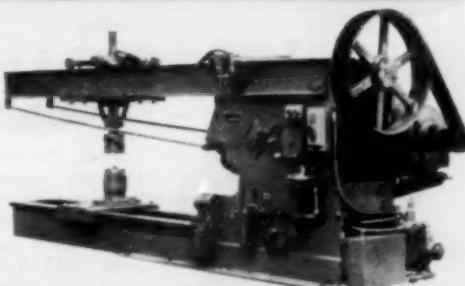
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FLANGING MACHINES and CIRCLE SHEARS

- No. 1 10 Ga. Circle Shear and Flanger.
- No. 4 $\frac{3}{16}$ " Cap. Flanger for flat and dished heads.
- No. 5 $\frac{1}{2}$ " Cap. Flanger for flat and dished heads.
- No. 6 $\frac{5}{16}$ " Cap. Flanger for flat and dished heads.
- No. 7 $\frac{3}{8}$ " Cap. Flanger for flat and dished heads.
- No. 56 Model 3/16" Cap. Elliptical Head Shear and Flanger.
- No. 60 $\frac{3}{8}$ " capacity circle shear with a 23" throat.
- No. 40 $\frac{1}{4}$ " capacity circle shear with a $15\frac{1}{2}$ " throat.



Above a No. 3— $\frac{1}{2}$ " capacity Flanger for flanging flat heads only from 19" up to 12". Offset rolls are available for offsetting the head. (Notice the new hydraulics on this machine.)

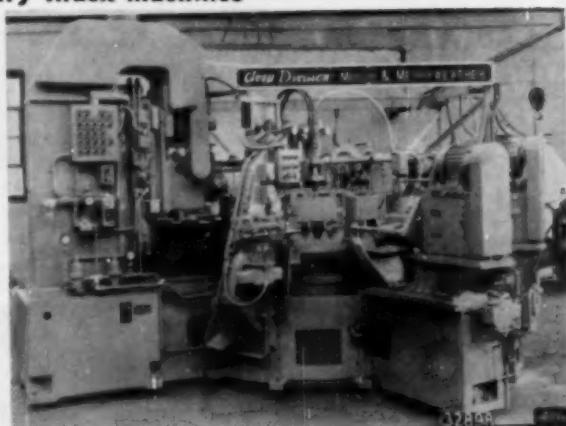
BLUE VALLEY MACHINE & MFG. CO.
6832 Truman Road KANSAS CITY 26, MO.

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Production Type Rotary Index Machines

Avey recently announced the completion of two large production type rotary index machines to mill, drill, chamfer, ream, and tap various holes and surfaces on automotive oil pump housings for one of the automotive manufacturers.

The machines employ automatic clamping, standard Avey components to J.I.C. standards, enabling one operator to produce approximately 240 completed parts per hour.



The Avey Div., The Motch & Merryweather Machinery Co., Cincinnati 1, Ohio.

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For High Speed Cutting of All Types
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Rate of Feed Indicator

This Model RF II assists in monitoring the rate of feed of machine tools using pneumatic or hydraulic actuators. Vertical turret type drilling and milling machines, and horizontal and vertical bor-



ing machines are examples. It is used effectively with automatically controlled linear actuators which require close observation, along with prediction and adjustment of rate of travel.

The unit is designed to monitor multiple speeds (within the specified operating range) without field calibration or adjustments.

Digitool Corp., 5300 Brownway Dr., Houston 27, Tex.

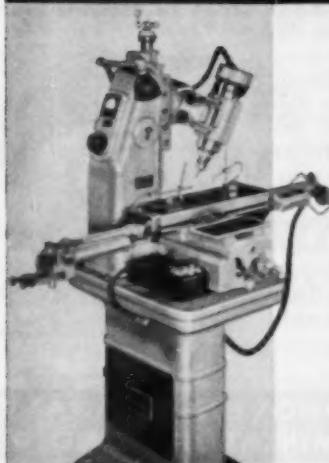
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MILLS TO .000,1"

Precise.

finishes under 10 microinches!

PRECISE HIGH RPM MILLING MACHINES



Compact, universal production machine tools for high precision milling. Ideal for accurate production of sub-miniature, optical and instrument components as well as larger parts used in hydraulics, aircraft, missiles. Uses carbide midget mills up to $\frac{3}{8}$ " diameter and grinding wheels up to 2" diameter. Precise Milling Machines are available in two models . . . with a power range from $\frac{1}{2}$ hp to 2 hp, and an infinitely variable speed range from 7,200 to 54,000 rpm. Both models can be furnished with Precise Universal Power Quills or Super Cycle Power Quills.

Precise

Grinder-Millers, Power Quills, Jig Grinders, Milling Machines, Automatic Drill Units, Cutting Tools, Vapor-Lub Cooling, Sklero Hardness Tester. Quality and Precision Since 1882

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Branch Plant: Precise, G.m.b.H., Duesseldorf, Germany

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to Speed Up Production!*

HEIMANN TRANSFER SCREW SETS

IN 11 SIZES—No. 6 to 1".
N.C. In all S.A.E. sizes.



Here is the faster, more precise way of transferring open end and blind screw holes—make savings in "wage-dollars-per hour" of your expensive hands on every job. A die-and-tool maker's tool with many other applications for die makers and machinists. A set of 6 Hardened Screws nested in combination holder and wrench—no other tools needed. Get more work now—save money tool.

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HOT STAMPING TAPE CHART indicates properties and applications for a variety of stamping work on plastics and other materials. Acroleaf is suitable for use in all "gold leaf" hot stamping machines and presses. Many standard colors are offered; specials on order. The product is processed on cellophane or Mylar (latter for jobs requiring greater strength). Individual recommendations will be furnished for particular problems. Samples free of charge. The Acromark Co., 15 Morrell St., Elizabeth 4, N.J.

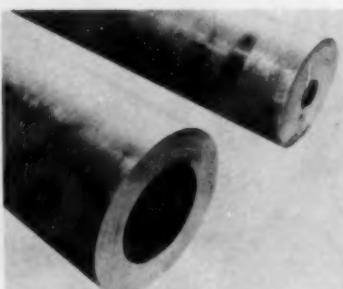
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Air-Hardening, Free-Machining Tool Steel In Hollow Bars

Mineor FM is a deep-hardening, nondeforming A-2 tool steel with free-machining properties. Addition of minute, uniformly dispersed alloy sulfides imparts superior machinability and self-lubricating action. Because it resists deformation in heat treatment, the steel is ideal for delicate parts. Its composition is 1.00% C, 0.50% Mn, 0.30% Si, 5.00% Cr, 0.25% V, and 1.10% Mo. The steel hardens between 1750-1775°F to give 63 to 65 Rockwell C. Sizes range from $2\frac{1}{4}$ " to $16\frac{1}{4}$ " O.D., $\frac{3}{4}$ " to $9\frac{1}{4}$ " I.D., with wall thicknesses from $\frac{3}{4}$ " to $4\frac{1}{2}$ ". Darwin & Milner, 2222 Lakeside, Cleveland 14, Ohio.

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Northwestern

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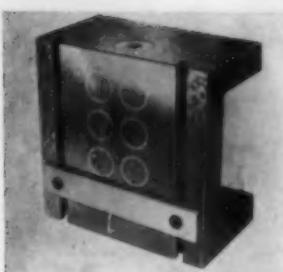
DAYTON 3, OHIO



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6" x 6" x 4" Magnetic Angle Plate

Inspection and layout of any ferrous metal is possible on a new magnetic angle plate, without use of clamps. Dimensions are 6" x 6" x 4". The plate is guaranteed to be square within .0002". An adjustable guide rail may be used as a reference or support and can be removed completely. The permanent magnetic chuck, which does not create magnetic distortion, is activated by a key. Price is \$155.

Bald Eagle Products Co., 60 East Fourth St.,
St. Paul 1, Minn.

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NEW! Profilometer® GROUP III



Measures Roughness of Surfaces from $\frac{1}{8}$ " to Flat — ID and OD

NEW Type LK Tracer measures on ID's and OD's as small as $\frac{1}{8}$ "; flats; tapers; narrow splines; gear teeth.

NEW Type QC Amplimeter shows roughness from 0 to 1000 microinches (arithmetical or r.m.s.) on easy-to-read meter. Has 3 standard roughness width cutoffs. Lightweight and portable; built for shop use; factory-calibrated for dependability.

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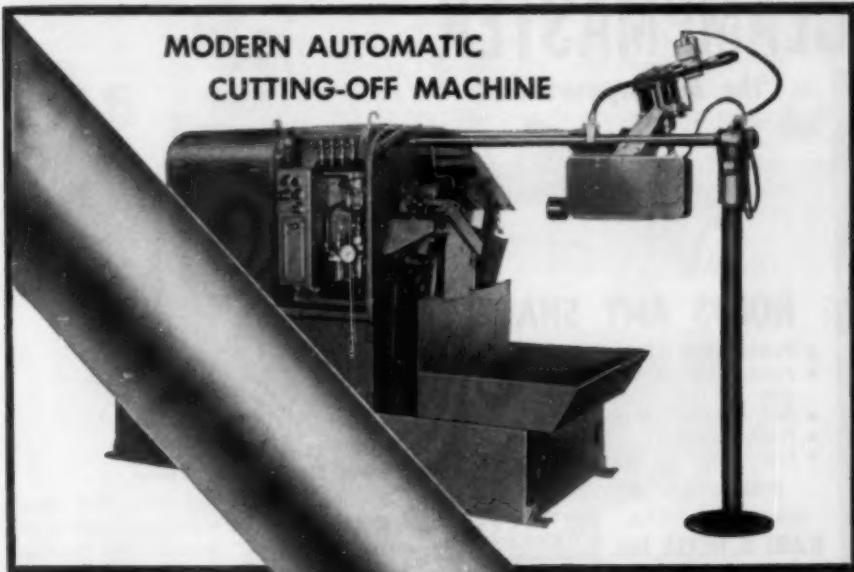
® Profilometer is a registered trade-mark.
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MODERN AUTOMATIC CUTTING-OFF MACHINE



Fast cut-off in lengths from a fraction of an inch to several feet with micrometer accuracy. Handles any length of stock and cuts any material that can be turned—bar stock up to 3" O.D.—tubing up to 8" O.D. Will cut-off, form, groove, flange and chamfer in a single operation—at a high rate of speed.

**CUTS TUBING,
PIPE AND
BAR STOCK
FAST**



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Describes all models. Complete specifications. Shows automatic bar feeder that handles entire load of stock with no operator attention, even with random lengths. Also, hot spinning machines and Safety Drill Tables.

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MODERN MACHINE TOOL COMPANY
JACKSON, MICHIGAN

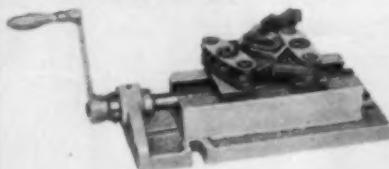
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CLAMPMASTER

"the All-Purpose Vise"



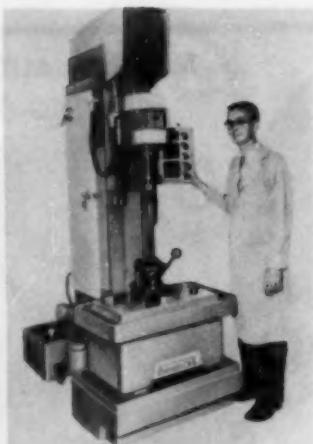
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Honer Designed For Small Diameter Bores

A new honing machine, for small diameter bores, is equipped with a 12" stroke and a 12" swing. The machine will hone bores up to 2" in diameter at maximum stroke.

The Plugmatic sizing mechanism maintains size consistency within .0002" from bore to bore on this honer. To keep floor space to a minimum, all electric controls are enclosed inside the machine column, and the coolant reservoir is an integral part of the base. The coolant pump and hydraulic controls are in the open at the sides of the machine, and the hydraulic tank is in the open at the rear of the column.

A simplified electric hone expansion unit controls the infinite hone feed



RICE MILWAUKEE DIE FILERS

The Complete
Die-Making Machines
for all operations . . .

FILING — SAWING LAPPING

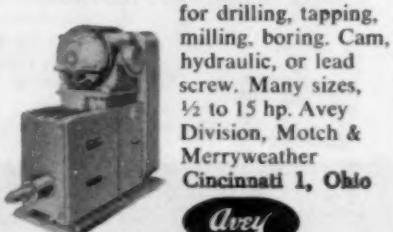
- Work table tilts 4 ways
- 11", 13" and 18" table sizes
- Choice of 2 or 4 speeds or infinitely variable, 100 to 475
- Improved overarms
- You can dial correct speed and stroke with Model FS-VSS

Send for Bulletins on the complete Rice-Milwaukee line of Die-Filers and Profile Grinders.

RICE PUMP & MACHINE CO.
226 PARK AVE., BELGIUM, WISCONSIN
In Milwaukee's Great Industrial Area

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DRILL FEED UNITS



Avey

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MACHINE and TOOL BLUE BOOK

adjustment. Rapid expansion, rapid collapse, and automatic compensation for stone wear also are electrically controlled. Infinitely variable speeds from 270 to 870 rpm are indicated on the plate on the right side of the column.

Barnes Drill Co., 852 Chestnut St., Rockford, Ill.

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Corrosion Computer

The H. M. Harper Co. of Morton Grove, Ill., is offering without charge

its 4" x 8" computer card that works like a slide rule and tells in seconds how each of eight types of metal withstands the corrosive effects of 141 chemical agents.

The metals are common in mechanical work—brass and naval bronze; silicon bronze; monel metal; stainless types 410, 416, and 430; stainless types 302, 303, 304, and 305; stainless type 316; copper, and aluminum.

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No more greasing your metal parts or products—this proven method stops rust completely with vapor from remarkable VPI WRAP. You save up to 50% on materials and labor and valuable production space, too. Learn how other companies have saved by modernizing their preservation methods.



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Automated Parts Handling System

A completely automatic, fully integrated, parts handling system is now available for high speed manufacturing, assembling, counting, packaging, etc., and can be adapted to any machine-existing, under construction, or

proposed. A vibrating storage-supply hopper enables holding for hours or days a constant supply of parts available for the vibratory parts feeder.

The feeder has a feed rate of up to 90' per minute. Standard sizes are: 5", 8", 12", 18", 24", 30", and 36" diameters with either clockwise, or counter-clockwise feed direction. The vibrating storage-supply hopper is equipped with a standard bin vibrator. Standard sizes are: 1, 2, 3, 4, 7, and 10 cu. ft. capacities; other sizes on request.

General Automation, 2315 W. Magnolia Blvd., Burbank, Calif.

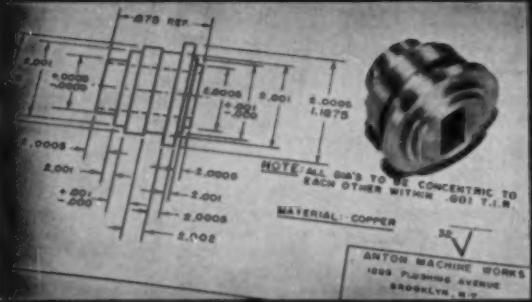
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Medium Duty Belt Grinder Has 90" Long Abrasive Belt

A new compact medium duty belt grinder is powerful enough to handle most grinding jobs, quickly and economically. Powered with a 3 hp or 5 hp motor, this grinder has a 90" long abrasive belt with an 8" contact wheel.

The new machine is slightly larger

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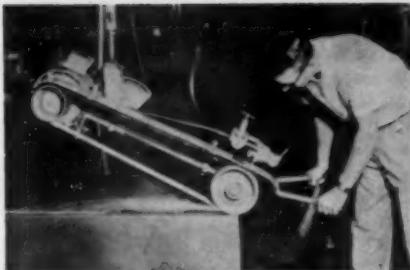
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MACHINE and TOOL BLUE BOOK

than the G & P 6-72 models and considerably smaller than the heavy duty abrasive belt units. This intermediate size makes it ideal for use where space is a problem.

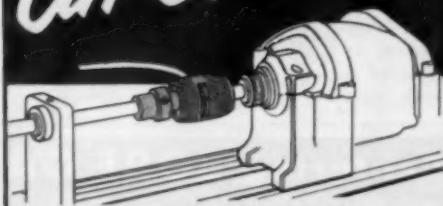
Standard accessories available will adapt the grinder for use as a floor stand unit, swing frame grinder or lathe mounted cylinder grinder or polisher.

Grinding & Polishing Machinery Corp., 2530 Winthrop Ave., Indpls. 5, Ind.



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SEALOL GUN DRILL ADAPTOR

— puts a modern gun drilling machine in your plant or shop for \$300 or less.

Convert solid spindle lathes, boring, drilling or milling machines for precision gun drilling. Sealol's Gun Drill Adaptor directs coolant to cutting edge where it is essential. Rotational speeds to 10,000 rpm — pressures to 1,000 psi. Type EL unit (not shown) attaches to outboard end of hollow-spindle equipment to transfer coolant to rotating gun drill.

Send for your free copy of "An Introduction to Modern Gundrilling" and bulletin information.



SEALOL INC.

2112 Post Rd. • Providence 5, R. I.

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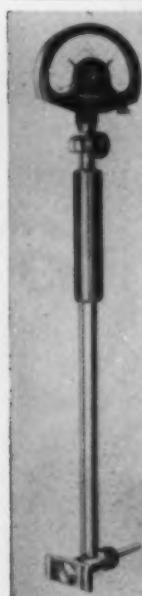
Economical Band Machine Has Roller Mounted Table

The Model 1612-UGT is said to bring big machine advantages of a work feeding table to the low-cost utility line, adapting this general purpose line for innumerable fast, light-duty production jobs. The model has a 16" throat and 12" work height. The 24" x 24" worktable has 12" of manual travel or 8" of travel with the weight type power feed attachment. For full use of this feature, a work stop and mitering attachment are furnished. Infinitely variable band speeds from 50 to 5,200 fpm in two ranges (selected by dial) enable the model to use a 1 hp motor and a wide range of saw bands from 1/16" to 1/2" wide.

Often it is necessary to trim, miter or cut apart small, lightweight, free machining parts. Frequently pushing this table through the saw band is faster than operating the controls of a power feed worktable. The work stop



Model has 16" throat, 12" work height, 24" x 24" table.



Self Centering BORE GAGE with INTERCHANGEABLE GAGING HEADS

Will Repeat within 50 millionths of an inch

AN INEXPENSIVE, ACCURATE AND DEPENDABLE INTERNAL COMPARATOR WITH A LEVER-AMPLIFICATION PRINCIPLE

SMALL BORE GAGES

With interchangeable, spring-loaded Split Jaw Measuring Heads.

Range .059 to .160"	\$110.00
" .160 to .280"	\$ 76.75
" .280 to .400"	\$ 76.75

LARGER SIZES

With a springloaded bridge, as illustrated.

Range .400 to .700"	\$76.75
" .700 to 1.400"	\$73.50
" 1.400 to 2.400"	\$73.50

Complete in Hardwood case, without gaging head. Additional charge for gaging head reading in .000050" . . . \$37.50.

Also available: • Heads Reading in 20 millionths or 5 tenths.

• Gages for holes to 32" Dia. • Gages for hole depths to 88".

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- Precision Comparator Stand for checking of mass-produced small parts.
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- Tungsten Carbide tipping of extensions and contact points.

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GRANT

PIONEERS
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PACEMAKERS
in their line



THE GRANT MFG. & MACHINE CO.
CE Station
Bridgeport 5, Conn.

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and mitering attachment virtually eliminate the need for special fixtures.

As other models in the utility line, this machine is equipped with butt welders. This not only permits them to use bulk saw bands but also to perform internal cutting.

The DoAll Co., Des Plaines, Ill.

Use postpaid card. Circle No. 116



Clamping & Jacking System

A new and smaller version of the Clamp-N-Jack System, the "B" Series, is similar in design to the original "A" Series except that all components are smaller. This makes the new series ideal for clamping and jacking on medium and small machines.

Components consist of swivel bases and strap clamps that are assembled together to provide an infinitely adjustable support for the clamp. Spacer tubes for added heights are included.

Universal Vise & Tool Co., Parma, Mich.

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**GRAYMILLS
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SYSTEMS**

Superbly engineered units of rugged corrosion-proof construction. Dual or single outlets. Precise liquid and air controls. Translucent containers let you see the liquid level. 1 and 2 1/2 gal. sizes for water, coolants or oil.

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3721 N. LINCOLN AVE., CHICAGO 13, ILL.

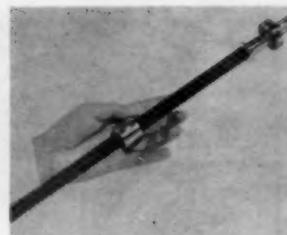
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MACHINE and TOOL BLUE BOOK

Rapid Elevation Or Traverse With Screw

A new anti-friction screw, featuring only four threads per inch, is designed as a replacement screw in a Delta surface grinder or for original equipment use. It will hold any elevated load such as grinding head, chuck, jack, etc. without slipping or counter-rotating. It offers pitch accuracy of 1/1000th of 1" to 1" of travel. It is anti-corrosion treated, unaffected by dust or grit, and needs no special lubricant. Dimensions are $\frac{3}{4}$ " dia. and 19" long; other lengths on request. Price is \$19.50.

R. C. S. Tool Co., 13861 Van Owen St., Van Nuys, Calif.



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REPCO Time-Saving Tools

ADJUSTABLE V-BLOCK DRILL JIG

Saves Set-Up Time—
Increases Output

Here is a versatile and accurate V-block that makes center and off-center drilling, tapping, and reaming easy and precise. Four-way V-block adjustment simplifies handling a wide range of work. Fast, easy positioning and clamping speed production. A centering locator plug and T-slots in the mounting surface plates assure fast, easy, on-center adjustment. Drill capacity #80 to $\frac{1}{2}$ " diameter. Handles stock from $\frac{1}{4}$ " to 2" diameter.



TRUE-CENTER ADJUSTABLE TOOL HOLDER



The REPCO Adjustable Holder is a precision-built tool, having two-piece construction which provides maximum freedom of the main body to compensate for as much as $\frac{1}{8}$ " machine misalignment. Cuts down on tool wear, breakage, and scrap.

TWO-PIECE VISE SET



Saves time with this versatile 2-Piece Machine Vise Set. Use as general-purpose vise, angle-block, or separate clamping device. Opening limited only to length of machine base. Light, accurate, rigid. Two sizes: 6" and 8".



CHUCK JAW TRUING-RING SET

This Ring Set saves time, cuts cost of boring jaws, with combs. With one ring on hand, you gain hours of productive time. Planed rings range from 1" to 4" by $\frac{1}{8}$ " increments. Handy taper-type rock keeps rings in place.



COMBINATION LIVE-CENTER SET

Heavy-duty live center plus six interchangeable adaptors, ranging from a point to $\frac{1}{2}$ " dia. ball. Saves costly set-up and machining time necessary to make longer centers or centers. Straight and various taper shanks available.

Write for complete information—Exclusive agent territories open.

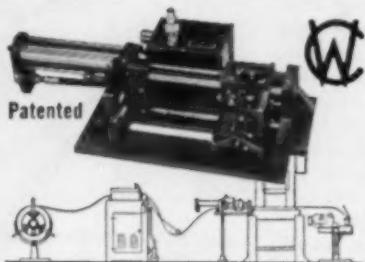
REPCO ROCKFORD ENGINEERED PRODUCTS CO.

2332-23rd Avenue • Rockford, Illinois

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December, 1960

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Patented

air operated slide feeds

For increased output and efficiency from your stamping and shearing equipment at low cost. Ideal automatic operation even on short runs, frequent changeovers. Nine sizes, up to 24" feed lengths, for flat or irregular stock to 3/16" thick and 30" wide in lighter gauges. Operates from standard air lines. Self contained.

COOPER WEYMOUTH, INC.
607 Honeyspot Road, Stratford, Conn.

Use postpaid card. Circle No. 373



Compact Subsonic Degreaser

The Vibra-Bantam, a new small subsonic degreaser, features high production automatic in-line cleaning for all small parts, without manpower. The Vibra principle uses a vibrating spiral elevator to move work rapidly through non-flammable cleaning solvents and vapors, thereby eliminating tote pans and baskets.

Though a compact 20" square with a 42" over-all height, the machine processes the full capacity of any screw machine, cold header, or punch press. Unit is available with steam or electric heat.

Manpro Corp., 1376 Hilton, Detroit 20.

Use postpaid card. Circle No. 119

Honing & Superfinishing Fluid Safe At High Temperature

Because it has a flash point of 275 F, Shear-Speed Formula 50 meets the honing-oil safety requirements of major American production plants. In addition, its combination of ingredients permits stock-removal rates as high as those with straight kerosene. The formula can be used with all types of honing and superfinishing machines and, because it is non-sulphurized, it can be used when finishing most metals. This fluid has good solvency and will keep the honing stone clean and free-cutting.

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Shear-Speed Chemical Products, Div. Michigan Tool Co., 7125 E. McNichols Rd., Detroit 12, Mich.

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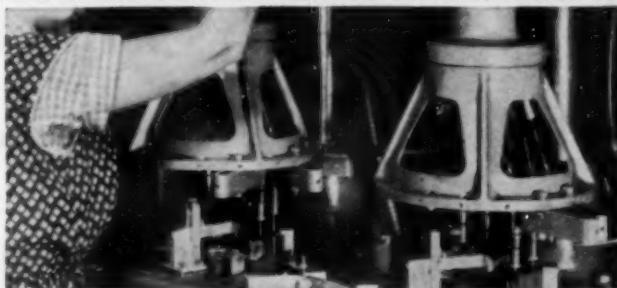
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Hammond
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Model
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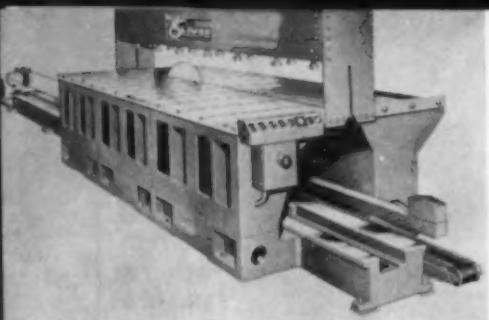
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This 849 plate saw, for cutting ferrous metals, has a capacity up to 3" thick x 12' long.

Heavy Duty Saw For Cutting Steel Plate

The No. 849 heavy duty plate saw is designed for cutting steel plate and other ferrous and nonferrous metals. The approximately 6½' long carriage rides on nonmetallic ways, which are 5" wide on one side and 6" wide on the other, with a total bearing surface of over 600 sq. in. The feed of the saw carriage is through a Reliance V-S drive to a reduction unit with a helical gear on the output shaft fitted to a helical rack located in the bed center.

Accurate feed settings can be determined by setting and marking of the rheostat control from the operator's position. Rapid return of the saw carriage is about 300" per minute.

The machine is designed to cut steel plate 3" thick by 8' in length.

Oliver Machinery Co., 445 6th St., N.W., Grand Rapids 2, Mich.

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This Model 2300 has sufficient accuracy and stability to be used with electronic gage heads as well as dial test indicators and permits measurements at heights up to 18". Its base measures 3" x 4¾".

Wide-range fine adjustment (up to .030") is located on the base, rather than on the arm as in most height stands, so that it can be operated without influencing the position of the gage head or indicator.

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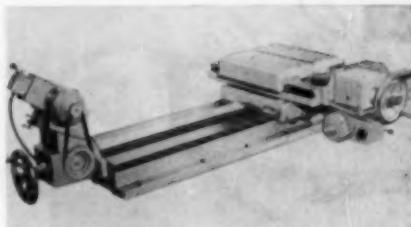
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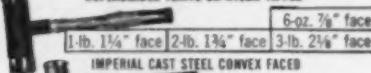
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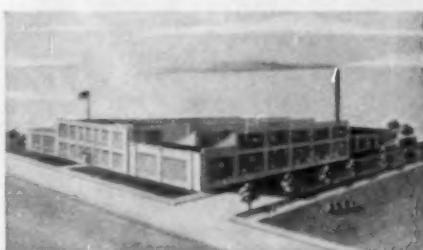
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Model 3-M has semi-automatic positioning which is accomplished by setting up x and y axis spacing with gage blocks, end measurers, or bar micrometers.

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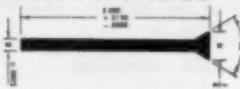
Card-controlled Model 3-C uses I.B.M. cards on which is punched out the blueprint dimensions for each job. When the card is inserted in the card reader, the machine automatically positions in both x and y axis for each hole location.

Tape-controlled Model 3-T operates from standard eight-channel tape as prepared on a Friden or Flexowriter, providing fully automatic locating of holes in two directions to an accuracy of $\pm .001$, with high repeatability.

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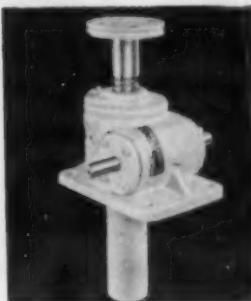


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Joyce-Cridland Co., 2027 E. 1st St., Dayton 3.

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NEW DOUBLE-ACTION TAP DRIVER, for use primarily on multiple-spindle machines which take adjustable-adapter shank tools, compensates for a difference in the feed of the spindle and the lead of the tap. It can be used both as a tension and a compression-type driver. Driver is made in six adapter sizes of $\frac{1}{2}$ ", $\frac{5}{8}$ ", $\frac{3}{4}$ ", $\frac{7}{8}$ ", 1-1/16", and 1-3/8". It is equipped with spring collets to accommodate taps from No. 0-6 to $\frac{3}{4}$ " hand taps or $\frac{1}{4}$ " pipe taps.

Seibert & Sons, Inc., Chenoa, Ill.

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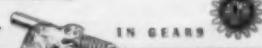
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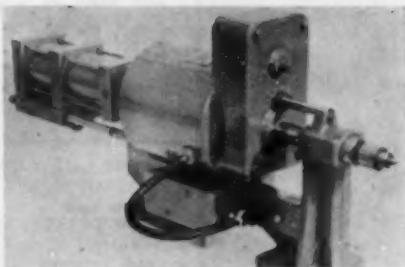
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MACHINE and TOOL BLUE BOOK

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Milling Cutter Extends Carbide Insert Life

A new line of Dex-A-Mill face and shell end milling cutters has been developed to extend carbide insert life, remove more metal per cutting edge, and to produce exceptionally fine finishes. Inserts are securely locked in position with a combination of positive lock on top and carbide anvil under the carbide inserts, to provide maximum rigidity and to permit higher feeds and speeds.

The indexable, throwaway carbide inserts are easily locked, unlocked, indexed, or replaced on the machine with the cutter in position.

Right- and left-hand cutters are available in face mill and shell end mill designs, with double negative rake angles and 15° lead angle in standard size diameters from 3" to 12"; and also in larger diameters as specials.

Adamas Carbide Corp., Market St., Kenilworth, N.J.

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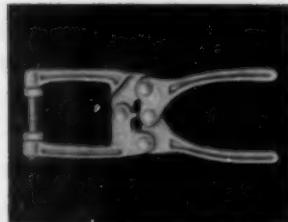
MACHINE and TOOL BLUE BOOK

6" Long Toggle Plier

The new Model 505 toggle plier is the latest addition to the Wespo plier line. The new lightweight plier is durable, easy to use, and has a quick, positive locking action. Use of alloy steel forgings and stainless steel rivets assure long life. Over-all length is 6", throat depth is 1 $\frac{1}{8}$ ", jaw width is 1 $\frac{1}{4}$ ", and the spindle is 1/4-28. Weight is 8 oz.

Wespo Div., Vlier Engineering Corp., 26935 W. 7 Mile Rd., Detroit 19.

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December, 1960

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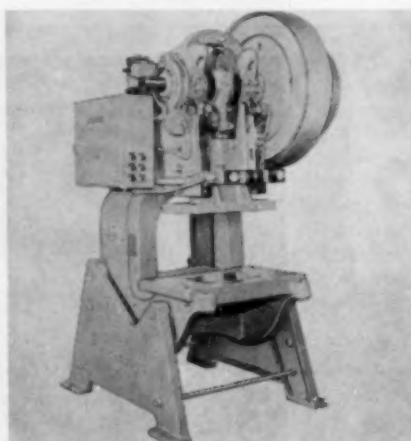
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Wide Bed Press With Box Ram

Model 45W is a 45 ton O.B.I. press with over-size features. Some of the specifications include: bed, 33" x 22"; ram face, 22" x 15"; opening through uprights, 21"; throat depth, 12". Press is available with a box-type ram, as illustrated.

This model is offered with a choice of mechanical or Wichita air clutch, fly-



Bed is 33" x 22"; ram face, 22" x 15".

wheel, or single geared drive, and standard or oversize flange ram, 26" x 15".

Johnson Machine & Press Corp., 620 W. Indiana, P. O. Box 426, Elkhart, Ind.

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JIG GRINDING and JIG BORING

to your specification

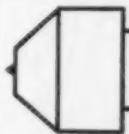
At your disposal. Our sub-contract jig boring department, one of the best equipped in the East.

A. K. TOOL CO., INC.

ROUTE 22, MOUNTAINSIDE, N. J.
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MACHINE and TOOL BLUE BOOK



Victory

Diamond Dressers

Directly from the Manufacturer
Made of Selected African Diamonds

DELIVERY FROM STOCK

Karat	Price
1/4	\$ 2.75
1/3	3.50
1/2	5.00
3/4	7.30
1	10.00
1-1/2	14.80
2	18.50
2-1/2	23.00
3	27.50

STOCK SIZES:

7/16x6 - 3/8x6 - 7/16x2
3/8x2

NO CHARGE FOR OTHER MOUNTINGS

Reject Thread Grinder Diamonds for many different uses in any shop. $\frac{3}{4} \times \frac{1}{4} \times \frac{1}{2}$ — $\frac{3}{8} \times \frac{1}{2}$ \$2.00 per tool. 6 tool min. order.

SPECIAL OFFER

Diamond clusters: any holder—any design 1 ct. \$10.00 per tool. Each additional layer (1 ct.) \$10.00 per layer.

Send us your sketch

**Prompt Resetting Service
Export Inquiries Invited**

VICTORY DIAMOND TOOL CO., INC.

P.O. Box 348, Dept. "M" East Orange, N.J.
Tel. ORange 4-4874



DIAMOND PHONO- POINT DRESSERS

60°	\$2.00	each
75°	1.80	each
90°	1.15	each

all in 1/8 or .081 shank, for 3/16"
\$.20 & 1/4" shank \$.40 extra each
tool.

THREAD GRINDING DIAMONDS

1/4 x 1" or 3/8 x 1—5/8" \$2.75 ea.
Min. Order 6 tools on the above.

CONED WHEEL DRESSERS

60 Degree Angle

1/8 Karat	\$ 7.50 ea.
1/4	11.50
1/3	12.50
1/2	20.00

75 Degree Angle

1/8	7.00
1/4	9.00
1/3	11.50
1/2	18.00

Other Cone Angles made up to your Order.
Delivery from Stock

VICTORY DIAMOND TOOL CO., INC.

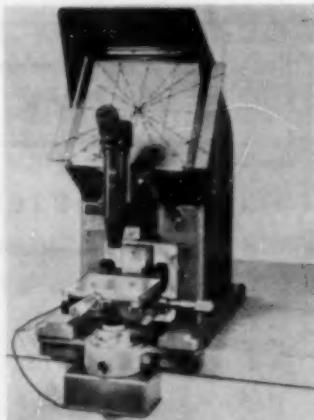
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Tel. ORange 4-4874

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Duplex Optical Comparator

A new Wilder model small parts comparator combines two instruments in one—an optical bench comparator and a toolmaker microscope. Basically it follows the same principle of design as in previous models of Wilder Micro-Projectors, viz. unit construction insofar as lenses, measuring tables, illuminators, etc., interchange or may be added at any time as needed.

In this new model an added feature is available by converting the instrument into a toolmaker microscope simply by replacing the projection lens by a Leitz toolmaker microscope tube as shown. This is particularly valuable in higher magnifications and measurements in surface illumination. Other features include ample working distance in all objectives for assembly operations, as well as a sliding screen



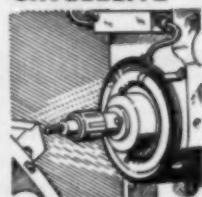
for zeroing to micrometer settings or quick check points.

Opto-Metric Tools, Inc., 137 Varick St., New York 13, N.Y.

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"Donut"-type fluorescent fixtures direct light into work without heat, shadows, obstruction. Wide application... easy installation... free literature.

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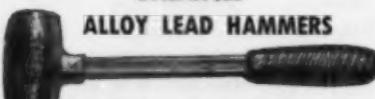


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ALLOY LEAD HAMMERS



HANDLES AND MOULDS

1, 1½, 2½ and 5 lb. sizes—order your alloy lead hammer requirements from your mill supply house.

or direct from:

KITZMAN MFG. CO.

Manufacturers Of Lead Hammer Products
15061 Hartwell Ave. Detroit 27, Mich.

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Compact Air Press Designed For Use With Notcher

A new compact air press has been especially built to accommodate the Vogel Arc-Fit which notches standard pipe and tubing to form perfect joints for welding and brazing. Notching unit, shown in the press, can notch upwards of 1000 pieces per hour. Press (with the unit) can readily notch standard piping up to 2" size and tubing up to 2½" O.D.

Unit shown is of 8-ton capacity and comes complete with all necessary operating controls including stand, but does not include the Arc-Fit.

The hand presses can be converted to



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Your business letterhead will bring literature
WATTS BROS. TOOL WORKS
Willmerding, Pa.

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MACHINE and TOOL BLUE BOOK



power presses. Stands can be purchased separately.

Vogel Tool & Die Corp., 1825 N. 32nd Ave., Stone Park, Ill.

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Confined-Area Marking Fixture

The Mecco Safety Confined-Area Marker makes use of extra long, straight body type to mark in a limited area, for example, within $3/64"$ of a flange on a series of round parts ranging from $7/16"$ to $1\frac{3}{4}"$ in diameter and up.

An arbor holds and rotates part to be marked. A geared handle and related linkage rotates the part being marked, while it moves the type across it. An adjustment screw allows compensating for varying diameters and depths of impression.

M. E. Cunningham Co., 1025 Chateau St., Pittsburgh 33, Pa.

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CICLOMATIC Production COPYING LATHE



For hi-speed automatic production of almost any combination of profiles . . . with an accuracy of $.0006"$. Available 2 sizes — $18"$ and $24"$ swings.

from
\$7,380

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THREAD CUTTING TOOL



**Provided with a scale
for angular setting.**

Circular Cutter, in high speed or carbide, has a negative profile and machines both thread flanks simultaneously. Thread cutting discs for all threads are available for both external and internal tool holders.

ACME TOOL CORP.

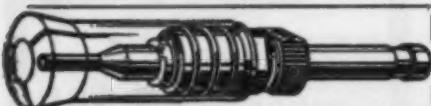
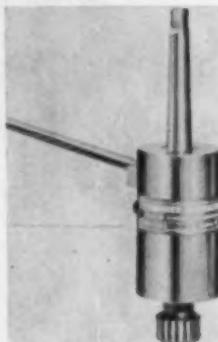
P.O. Box 1165 CORAL GABLES 34, FLORIDA

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Midget Tapper For Small Drill Units Or Drill Presses

A new Midget tapper, designed for use with small drill units or drill presses, is only 1-9/16" dia., and handles taps up to 10-32 in steel. Tapping torque is controlled by operator's finger pressure on the drill press handle. Pressure sensitivity provided by the spring clutch allows operator to "feel" the tap through the work. Should the tap become "loaded" or "bottom," the clutch will slip in warning. Tapper is equipped with Jacobs Rubber-Flex collet, and is available with No. 1 or No. 2 Morse taper shank, as well as a 1/2" straight shank. Commander Mfg. Co., Chicago 24, Ill.

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NEW! Self-Centering SC Collet Stop

Quick friction adjustment. Stays in fixed position. Will not distort collet. Will not move bush. Also available for other collets and spindles. 30 Days Free Trial. Several Territories Open for Distributors.

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THE BYSTROM COMPANY
6106 Park Ave. South Minneapolis 17, Minn.

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T A P G R I N D E R
Sharpens Chamfers, Flutes
and Spiral Points



Model 1100

- Capacities No. 0 Machine Screw to 2 1/2" Hand Taps.

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HENRY P. BOGGIS COMPANY
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Wire Swaging Technique

A controlled method of flattening wire results in an attractive finished appearance. Illustrated is 3/8" dia. wire



which has been swaged and pierced. In forming, the metal is displaced into a die to make a smooth transition from the round wire to the flattened area.

E. H. Titchener & Co., 57 Clinton St., Binghamton, N.Y.

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CAM MILLING

Fully equipped modern machine shop with extensive Jig Boring, Surface Grinding, Horizontal Boring, and Thread Grinding facilities as well as modern Cam Milling and Cam Grinding equipment.

Your Inquiries Answered Promptly

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FOR AS LITTLE AS \$65 YOU CAN NOW HAVE THE CONVENIENCE OF A Gusher TANK UNIT

Yes, your Ruthman Gusher Tank unit is an efficient coolant system which will supply copious coolant flow for machines which are not equipped with coolant pumps or as auxiliary or fully portable systems.

- Precision Built
- Re-uses Coolant
- No Priming Necessary
- Fully Portable
- No metal-to-metal contact
- Dynamically Balanced



T-16, T-32, T-50—1/4 to 1/2 HP
Tank capacity 16, 32 and 50 gals.

THE **Ruthman**
Machinery Co.
1816 Reading Road
Cincinnati, Ohio

FREE!!

Tank Selection Bulletin in 61A, including capacities, motor characteristics, etc.
Write today or call
MAin 1-5462.



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December, 1960

259

MAGNETS?

CALL **PERMAG**

in N.Y. **OLYMPIA 7-1818**
(TWX: NY 4-4798)

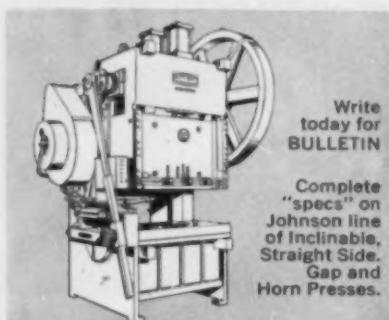
IN L.A. **WEBSTER 6-6251**
(TWX: LA-2086)

All sizes, shapes, grades in stock... Alnico and ceramic... sintered, cast. Engineering, grinding, cutting, magnetizing, 24-hour delivery. Write for catalog.

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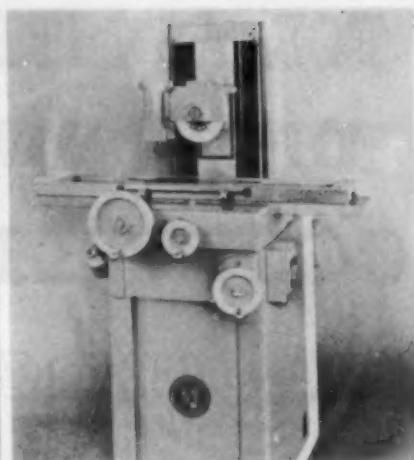
PERMAG PACIFIC CORP.
2910 S. LA CIENEGA BLVD.
CULVER CITY, CALIF.

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260



Surface Grinder Has Easy Moving Hand-Operated Table

The new hand-operated 618-HR Rollerway grinder uses precision-ground, matched rollers to attain an easy moving hand-operated table. A total of 78 precision rolls support the table and work.

This model is also equipped with a table locking device which is said to assure absolute stability when dressing the wheel.

A variable tensioning device compensates for those operators doing a special grinding job for which the table might move too freely. This, plus the proper gear ratio for turning the hand wheel, eliminates the so-called "snap" when reversing the table to overcome the inertia of the table motion when the table is heavily loaded.

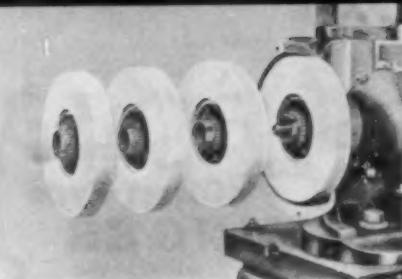
To ease the operator's motions, spring loaded adjustable bumpers have been added for the stop dog to contact at table reversal.

Reid Brothers Co., Inc., Beverly, Mass.

Use postpaid card. Circle No. 140

Mounts Simplify Wheel Interchange

A new taper spindle is now available from the R-O grinder that accepts



taper wheel mounts having 3" TPF, I.D. bores. It speeds up the job of changing wheels. By predressing all the wheels for a job and interchanging them faster, the whole job of sharpening multi-cut tools is simplified.

Taper wheel mounts are available in lengths for wheels 1/16", 1/4", 1/2", and 3/4" thick. Special wrenches are provided for removing wheels and mounts.

R-O Manufacturing Co., 31171 Stephenson Hwy., Madison Heights, Mich.

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Small Center Lapping Machine Simultaneously Laps Both Ends

A new center lapping machine, made especially for lapping centers in small parts, makes it possible now to lap standard as well as recessed center holes from 1/16" dia. and larger, at a highly increased production rate. The machine is designed to lap both centers simultaneously in pieces up to 8" long. Two opposing precision high-speed spindles are individually driven by 10,000 rpm motors with reversible switches.

J & S Tool Co., Inc., 87 Dorsa Ave., Livingston, N.J.

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MAGNETIC BASE INDICATOR HOLDER

1/4" dia. non-magnetic stainless steel Model 200B—Price \$6.95 rod complete with 5/16" and 3/8" O.D. bushings. Fine precision adjustment identical to surface gage. Hardened ball socket setting permits universal positioning. Powerful 50-lb. pull magnetic base insures firm grip on any ferrous surface curved or flat.

WRITE FOR CATALOGUE NO. 958

CULLEN MANUFACTURING CO., INC.
1605 Washington Ave. Racine, Wisc.

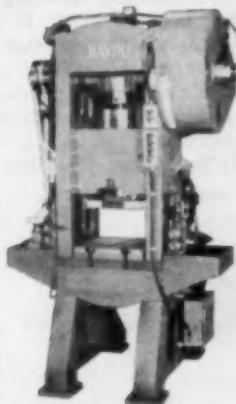
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December, 1960

HAVIR

HI-PRODUCTION AUTOMATICS

Belong in the center of your quality production picture!



... 25 ton model illustrated. HAVIR Automatics range from 5 ton to 200 ton capacities. Designed and built for high production, precision work ... long die life. Many extra features and modifications to meet your particular needs. For the facts in detail. . . .

Send for New 8-Page Catalog

HAVIR
Manufacturing Company
442 Cleveland Ave. St. Paul 4, Minn.

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Plain Type

TRADE



AUTOM

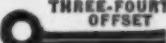
MARK



Offset Type

CONTINUOUS HINGES

All hinges shown can be furnished with special holes, cutouts and bends to blue-print in metals to suit the job.



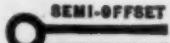
**THREE-FOURTHS
OFFSET**

**AUTO MOULDING
& MFG. CO.
1110 E. 87TH ST.
CHICAGO 19, ILL.**

Use postpaid card. Circle No. 416

SPECIFICATIONS

Open width $\frac{7}{8}$ " to 6"
Gage Material .040 to .187"
Pin Diameter .093" to $\frac{1}{2}$ "
Lengths to 120"

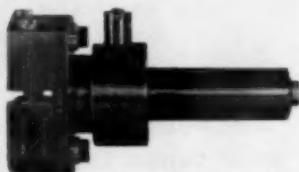


SEMI-OFFSET

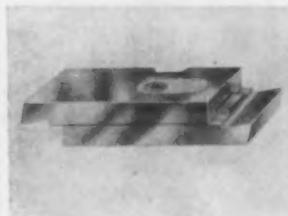
Combination Release & Non-Release Tap Holder

The RoyEL combination releasing and non-releasing completely floating and adjustable tap holder has $1\frac{1}{2}$ " capacity. It can be used on both turret lathes and automatics. A half turn of the tripping dog in the reversing mechanism changes direction of the tool for right- or left-hand tapping. Sliding jaws move vertically to accommodate $7/16$ " to $1\frac{1}{2}$ " tap sizes.

RoyEL Tools, Inc., P.O. Box 7486, Minneapolis 22.



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Tolerances can be held to .0005"; finish is 50 to 100 rms, depending on feed, speed, and material.

Floating Reamer Gives Extra Tool Life

The Doublife floating reamer is designed to give twice the normal tool life. Using a method of extending the cutter blades, the tool, after a normal amount of cutting life, can be extended for an equal amount of bonus life. Mating parts slide on precision ground "V" and flat ways. Cutter may be adjusted to size while it remains in the bar. Reamer does not have to be circle ground—two cutting edges are easily ground and set to desired size. Tolerances are reported to .0005" and finish produced is 50 to 100 rms.

Madison Industries, P.O. Box 1137, Providence.

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SPELLMACO "SPOTTERS"

A matched set of transfer punches
for toolmakers, machinists & tool cribs

Used for transferring location of threaded, drilled
and reamed holes, slugs, blanks, etc.

Precision made of finest tool steel—Carefully heat treated and tempered for long life—.0025 undersize to facilitate use—Black oxide finish
Set No. 3-17, 28 punches with indexed stand—sizes $3/32$ " to $1/2$ ", by $1/64$ "—
plus handy $17/32$ " size. Length 4-7/8" ONLY \$19.40
Single sizes available

R. L. SPELLMAN CO. - URBANA, OHIO

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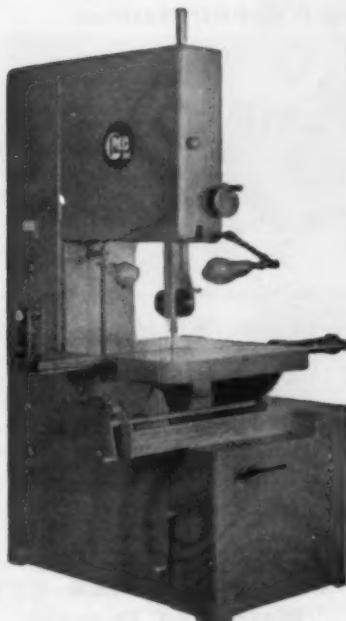
MACHINE and TOOL BLUE BOOK

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SPELLS THE DIFFERENCE IN
BAND SAW MACHINES

The new GROB 24" universal band saw
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Utility • Low Maintenance • Reasonable Cost



- Speeds infinite from 35-12000 FPM covers both cold and hot sawing
- Variable drive 3-speed transmission with precision rolled gears and splines transmits 15 HP
- Hydraulic table feed

See the difference demonstrated in our dealers' showrooms

or

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GROB also manufactures a complete line of:



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**BUTT WELDERS
FILING MACHINES
GEAR ROLLING MACHINES**



Multiform BENDER CUTTER

CUTS, BENDS, PUNCHES

Available in hand, air and hydraulic models, the MULTIFORM is shipped complete with full assortment of dies and mandrels to punch, bend and cut round or flat brass, bronze, aluminum, steel, etc., up to $\frac{1}{4}$ " x $1\frac{1}{2}$ " as illustrated, other models up to $\frac{1}{2}$ " x 8".

J. A. RICHARDS CO.
KALAMAZOO, MICH.

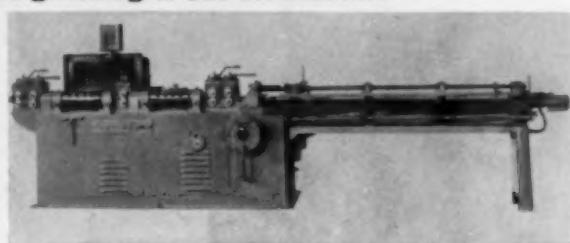
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Flying Shear Wire Straightening & Cut-Off Machine

Model No. 112A-TC
Patterson automatic wire straightener offers new concepts for straightening and cutting off wire at higher speed. Dual straightening arbors, revolving in opposite direction, practically eliminate the twisting and spiral effects normally produced at higher speeds.

The machine is of value to the fabricators of high tensile wire, spring, tool steel, stainless, and alloys where twisting is undesirable for subsequent operations.

Three motors provide for more flexibility. The flywheel shaft drive, which actuates the cut-off head through a

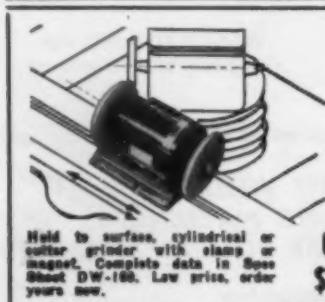


Transit-Cut unit has the advantage of dual straightener arbors.

Wichita air clutch, runs at full selected speed continuously, eliminating any stalling on cut, while feed roll housings and rotary straightening arbors are wired in parallel so that both units start, stop, reverse, or inch together.

The Geo. C. Patterson Machine Co.,
3409 Trumbull St., Cleveland 15.

Use postpaid card. Circle No. 144.



Hold to surface, cylindrical or cutter grinder with clamp or magnet. Complete data in Spec Sheet DW-160. Low price, order yours now.

Announcing NIAGARA CUTTER Motorized Dresser to Cut Replacement Cost of DIAMOND WHEELS

Quickly pay for themselves by dressing wheels with minimum removal of costly diamond surface. Motorized to eliminate friction drive and hogging. "Kiss" touch and control.

NIAGARA CUTTER

Div. of BOLLIER-DAMERELL, INC., 334 Niagara
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Manufacturers of Milling and Angle Cutters, Carbide
and HSS Saws, Slitters, Face Mills and Special Tools.

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**NEW!
DIFFERENT!**

MagnaLift LIFT MAGNET
with self-contained power supply

for scores of lifting jobs...
for conveyors and other automatic handling equipment



Use it in the plant. Use it outdoors. Use it with remote control. Take advantage of MagnaLift's Variable Holding Power for jobs like lifting steel sheets one at a time from a stack. You'll like MagnaLift features like these: Power pack an entirely separate unit from magnet—power pack can be placed on magnet or placed elsewhere for remote control by extension cable—OFF-ON switch located on top of unit for maximum convenience—built-in charging indicator and plug-in receptacle for battery power pack. You'll like the way MagnaLift makes lifting jobs easier, safer, faster. Send for complete details about MagnaLift, the new and different lift magnet. Write Dept. BH-126.

Model LM4, \$385.00 F.O.B. Big Rapids, Mich.

4000 LBS.
CAPACITY

**3 Power Packs
(Interchangeable)**

12-VOLT BATTERY

12-VOLT BATTERY—
VARIABLE HOLDING
POWER

110-VOLT A.C.—
BUILT-IN D.C.
RECTIFIER

Hanchett MAGNA-LOCK CORPORATION BIG RAPIDS, MICHIGAN, U.S.A.

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December, 1960

265

NEW Size Range in the **JONVIR BELT GRINDING ATTACHMENT**

BGA-81
contact wheel, 8"
dia. Width 1" to fit
spindle 5/8".
Belt size 30" x 1".



Jonvir, originator and manufacturer of the widely used BGA (Belt Grinding Attachment) now introduces attachments using contact wheels up to 8" diameter x 2" face. This new size now offers a selection range from 2" up to 8" diameter.

Write for Literature.

**JONVIR
MANUFACTURING CO.**
25120 RYAN ROAD WARREN, MICHIGAN

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266

Safety Switches Withstand 200,000 Amp Short Circuits

The new General Electric heavy duty (Type TH) and heavy duty interrupter (Type THD) switches are reported as capable of withstanding the tremendous energy of a 200,000 ampere short circuit when used with G-E CLF high capacity or other current limiting fuses of comparable characteristics as defined in NEMA Standards FU1-1959. The new



switches are reported as the answer to industry's need for a low cost enclosed safety switch capable of protecting heavy electrical equipment installed where available short circuit current exceeds 100,000 amperes RMS.

The switches are available in ratings from 30 to 600 amperes, 250 and 600 volts a-c.

Circuit Protective Devices Dept., General Electric, Plainville, Conn.
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Hydraulic Power Units Range From $\frac{1}{2}$ to 10 HP

A complete line of hydraulic power units range from $\frac{1}{2}$ hp to 10 hp. They also range from 1.7 gpm to 13 gpm at 1250 psi and 5000 psi. These power units are portable, or semi-portable. Weight ranges from 20 to 770 lb.

Some units are hand operated, others are foot operated, and most can be operated by solenoid remote controls.

W. A. Whitney Mfg. Co., 636 Race St., Rockford, Illinois.

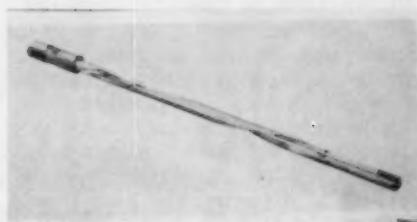
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MACHINE and TOOL BLUE BOOK

Gun Drills Operate At High Speeds & Feeds

The newly-designed target and center-cut gun drills with "gun-twist" shanks has been introduced. Twisted or helical fluted shanks provide smoother operation and better balance at high spindle speeds.

The new gun drills are said to greatly reduce undesirable whipping and vibration which is often encountered when medium and small-diameter, conventional gun drills are run at high rotational speeds. National gun drills



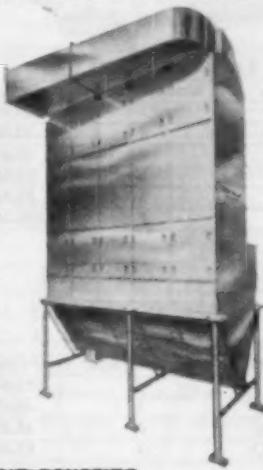
with the new "gun-twist" shank are dynamically-balanced tools.

National Twist Drill & Tool Co.,
Rochester, Mich.

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NEW TORIT DUST COLLECTOR IS AUTOMATIC!

Save real dollars with the benefits from this automatic dust collector. No more interruptions on production lines! Maintenance problems are practically eliminated. This all new continuously cycling TORIT dust collector automatically cleans your air and automatically shakes its own filters and blows them clean with reverse air flow. Collected material is emptied automatically.



OTHER EXCLUSIVE TORIT BENEFITS

- automatic filter-shaker mechanism is simple, maintenance-free
- different dusts may be collected separately
- highest air-to-cloth ratios (from 5 to 25:1) and longer filter life
- only $\frac{1}{4}$ H.P. required for fully automatic operation
- polished $\frac{3}{8}$ " aluminum construction for minimum floor loading
- modular design—5' wide x 4'-8" long (for two sections) x 15'-6" high—saves space, lends ease and versatility to installation. Use up to 12 modular sections for each application! No limit to CFM capacity!

Write today for literature.

TORIT MANUFACTURING COMPANY

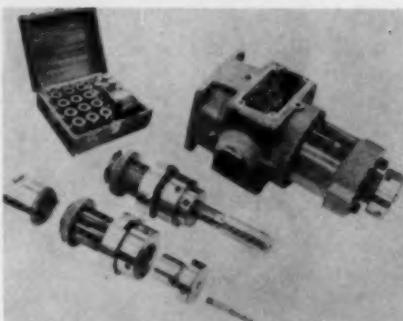
Automatic Collector Division

1133 Rankin Street, St. Paul 16, Minnesota, Dept. 635

Use postpaid card. Circle No. 424

Tapping Head Increases Production of Quality Threads

A new Burgmaster "Leadmatic" lead screw tapping head is reported to greatly improve the finish and accuracy of tapped threads, and eliminate scrap due to pulled or loose threads. Quickly interchangeable lead screws are available for NF and NC threads from $\frac{1}{8}$ " through 1" diameter. The head is sold with one lead screw, lead nut and tap

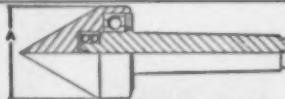


LIVE CENTERS



LIVE CENTERS

Head No.	Morse Taper	Price
2	2	\$28.00
3	3	\$32.00
4	4	\$40.00
5	5	\$52.00
6	6	\$75.00
7	7	\$95.00



TUBING CENTER SPECS.

No. No.	"A"	Morse Taper	Price
2	$\frac{1}{8}$ "	2	\$32.00
3	$\frac{2}{8}$ "	3	\$40.00
4	$\frac{2\frac{1}{2}}{8}$ "	4	\$43.00
5	$\frac{3\frac{1}{2}}{8}$ "	5	\$57.00



STRAIGHT SHANK CENTERS

No. No.	Shank Size	Price
3	$\frac{1}{8}$ "	\$40.00
4	$\frac{1\frac{1}{2}}{8}$ "	\$53.00
5	$\frac{1\frac{3}{4}}{8}$ "	\$65.00
6	$\frac{2}{8}$ "	\$75.00
7	$\frac{2\frac{1}{2}}{8}$ "	\$85.00

Head of any other size and shape can be furnished to specs. Standard shanks made with Morse tapers, other tapers special, always specify Head and Taper—4 page catalog on request.

STURDIMATIC TOOL COMPANY
2675 F ST., DETROIT 16, MICH.
Use postpaid card. Circle No. 425

collet as standard with lead, collet diameter as desired.

Especially suited for tapping tough materials and blind holes, the unit is furnished with a timer that allows tapping to depth, and tap retraction from the hole.

These tapping heads are designed for use on single spindle equipment and Burgmaster turret drills.

Burg Tool Manufacturing Co., Inc., 15001 So. Figueroa St., Gardena, Calif.
Use postpaid card. Circle No. 197

NEW TENTH PLUG GAGING SYSTEM CUTS JOB COST 22% FOR CRITERION MACHINE WORKS



"Saved 8 hours grinding 500 $\frac{1}{2}$ " diameter holes, by using Deltronic's system instead of go-no-go method we used formerly on this same job," states Clarence Vanderspol, superintendent of production at Criterion. "A \$30.00 direct cost saving was made because our operator had exact size information at all times within a tenth, so that job progress and final sizing were under complete and accurate control from start to finish." The Deltronic 25 gage $\frac{1}{2}$ " set cost Criterion \$41.95, almost paid for itself on one job. Class "X" tolerance, 1 microinch surface finish, plus the flexibility of 269 different go-no-go gaging combinations in each 25-gage set, make Deltronic a "BEST-BUY" for any shop boring to .0005" or better accuracies. Unconditional guarantee.

FREE! "Shortcuts' Booklet!

"Gaging Shortcuts" booklet on how to save time and money on routine close-tolerance gaging operations. Illustrated and explained in detail. Sent free on request. Deltronic, 929 Baker St., Costa Mesa, California.

DELTRONIC

Use postpaid card. Circle No. 426

JARVIS UNVEILS A REVOLUTIONARY DESIGN IN COLD FORMING TAPS! NEW JAR-FLO **LUBE-GRUV® TAPS**

**LUBRICATION GROOVES MAKE
CHIPLESS FORMING OF INTERNAL THREADS
AS EASY AS CONVENTIONAL TAPPING!**



NOW, for the first time, cold forming taps that give full time lubrication to the forming contact area during the full tapping cycle.

LUBE-GRUV gives you a far superior finish on the formed threads than is possible with conventional cold forming taps.

USE CONVENTIONAL TAPPING EQUIPMENT. The combination of positive lubrication and narrow contact surface makes the forming of internal threads much easier than with ordinary cold forming taps. Jar-Flo with LUBE-GRUV has less drag, requires less driving torque.

LUBE-GRUV Jar-Flo TAPS FOR CHIPLESS
FORMING INTERNAL THREADS IN DUCTILE MATERIALS:
STRONGER THREADS - NO CHIPS -
AVAILABLE IN PLUG OR BOTTOMING TYPES

SEND FOR
COMPLETE
DETAILS

Jarvis CORPORATION

JARVIS CORPORATION, 182 Washington Park
North Attleboro, Mass.

Have Rep. call _____ Rush LUBE-GRUV Brochure

Name _____ Title _____

Company _____

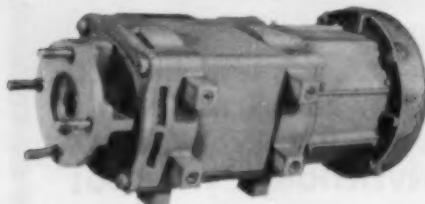
Street _____

City & State _____

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Direct Current Motor

A new Model 4110 lightweight motor (with a square type frame) is designed



for operation on D.C. power sources. The motor features a Hoover Electric

designed flame quench device whereby maximum cooling air is drawn through the motor while the unit is able to meet the explosion proof requirements of Procedure II of specification MIL-E-5272B. Thus, a smaller and lighter motor can be provided as use of these flame quench rings permit greater heat dissipation and a higher output rating for a given motor frame size.

Features include: 4.0 hp at 8500 rpm continuous duty; 6.0 hp at 7300 rpm continuous duty; 26.6 volts D.C.; 10.94" long, 5.0" wide, 6.4" high.

Hoover Electric Co., Columbus 19, O.
Use postpaid card. Circle No. 196

SELF-LOCKING CAPSCREW features great tensile strength, and resists vibration, corrosion, and high temperatures. When the cap picks up all the load it can carry, the cap's configuration permits it to adjust to torsional loads, equalizing stresses and applying constant pressure through cap's elasticity. Klincher Kapscrew is available in various metals and materials, and all standard sizes. Klincher Kapscrew, Inc., Dept. SLK 290, 2153 Hillside Ave., Indianapolis 18.

Use postpaid card. Circle No. 196



C A U T I O N !

This word will appear next month on the wrapper around each copy of MACHINE and TOOL BLUE BOOK to remind you readers that . . .

JANUARY is VERIFICATION MONTH

Our circulation auditors require certain information about every reader to qualify him as a recipient of MACHINE and TOOL BLUE BOOK. The protective wrapper around your January issue will contain a form to be used to give us this information. Proper completion of the form and prompt mailing to us in your company envelope will assure your continued receipt of this magazine. We will appreciate your help.

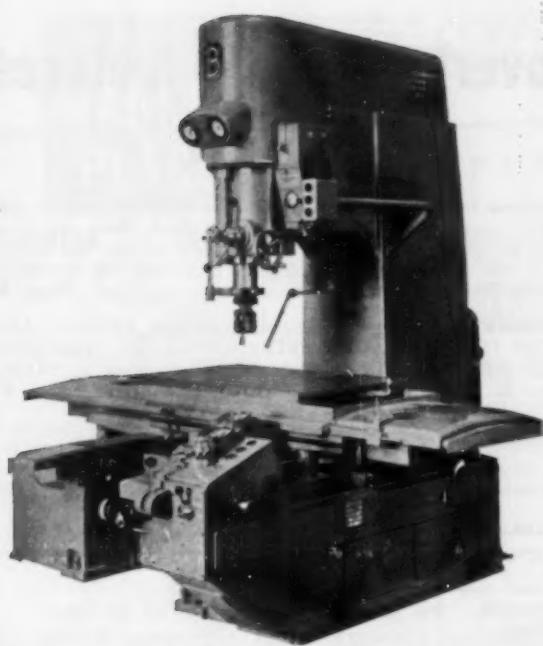
Clipper Diamond Products

Clipper can offer today the most complete line in our history of diamond tools (including special applications), diamond drills and diamond wheels . . . using Natural, Man-Made or SMD diamonds, with improved bonds in Resin, Metal or exclusive Ceramet (vitrified).

CLIPPER DIAMOND TOOL CO., INC.
345 Hudson Street, New York 14, N.Y.

Use postpaid card. Circle No. 428

MACHINE and TOOL BLUE BOOK



**Model HYOP 120
(48" x 30" Table)
32" Vertical**

**BURKHARDT OPTICAL JIG-BORER
—The most modern design—**

- Single Lever Control
- No Gears, No Leadscrews
 - All Movements inf. Variable
 - 5" Quill—8 HP Motor
 - LEITZ Optics 0.00005"

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Milwaukee 16, Wis.

3906 N. Sherman Blvd.

Tel.: UPTown 3-0899

Midwest's Leading Importer of German & Swiss Prec. Machine Tools

STOCK DELIVERIES

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don't overlook these features

- ▶ Your Choice Of Machine Influences The Cost Of The Part because usually there's more than one machine which can do the job. And, there are times when it is not obvious which machine is best. Harry Conn reviews the factors which help make up the selling prices of a part and how the choice of machine can influence this very same price.**Page 81**
- ▶ Inspecting The Complete Die is outlined by means of a 25-point check list in Paul Prikos' THE PRACTICAL DIEMAKER. As Paul says, "Even when two dies are built identically, each die still has to be touched up slightly different."**Page 91**
- ▶ New Electroshaping Process Machines Toughest Alloys and may prove to be capable of duplicating all of the conventional metal-shaping operations we all know so well. Developed by Battelle Memorial Institute, the process is an application of established electrolytic technology.**Page 106**

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Advertisements acceptable in THE MARKET PLACE include those for employment, sales services, production facilities, representation and related needs. Rates: \$20 per column inch per insertion. Maximum size advertisement accepted in this section is three inches.

Copy should reach us by the first of the month for next month's issue.

MACHINE and TOOL BLUE BOOK

A Hitchcock Publication

Wheaton, Ill.



Compressed Air Filters Feature Coalescent Action

King Engineering Corp., P.O. Box 735, Ann Arbor, Mich., announces a line of compressed air filters that is reported to remove practically 100% of the entrained dirt, oil and water from the air and normally operates for months without maintenance. The filters are for use with pneumatic instruments and controls, spray guns, vacuum pumps, etc. Maximum flow rates range from 20 to 200 standard cfm, and pipe sizes range from $\frac{1}{4}$ " to 2".

On entering the filter, the air flows downward through a wet filter bed in a scrubber cartridge. This cleans the air. In addition, mist and fog particles of oil and water coalesce and combine into larger drops as they pass through the wet filter bed to a sump below. When the air leaves the scrubber cartridge, it passes upward through a dry-bed polisher. Both cartridges are disposable.

Use postage card. Circle No. 127

MACHINE CLEANER

Cleans clogged T-slots \$1.95
...spoons out chips \$19.50
and brushes them away.
Fast! Efficient!

Convenient design, heavy duty construction . . . reduce machine cleaning "down time". Thousands in use. Order from dealers or direct. Send for literature.

"Clean machines produce more and last longer"
KELM MFG. CO. • #2 Coloma, Michigan

**HEAVY DUTY
DOVETAIL SLIDES**

These slides are built to take steady use. All are fitted with tapered gibbs. Available in 2, 3, 4, 5, 6 and 8 inch widths.

Biddle Engineering Co.
P.O. Box 31 Warrendale, Pa.



—Tested Know-How
& Show-How—
MACHINE TOOL
RECONDITIONING

Send for free folder describing
illustrated book featuring hand
scrapping methods (4th printing)

Machine Tool Publications
215 Commerce Bldg.
East 4th Street St. Paul 1, Minn.

Just a reminder

Look for the word "**CAUTION**" on next month's wrapper. **January** is **Verification Month**. See explanation on page 270.

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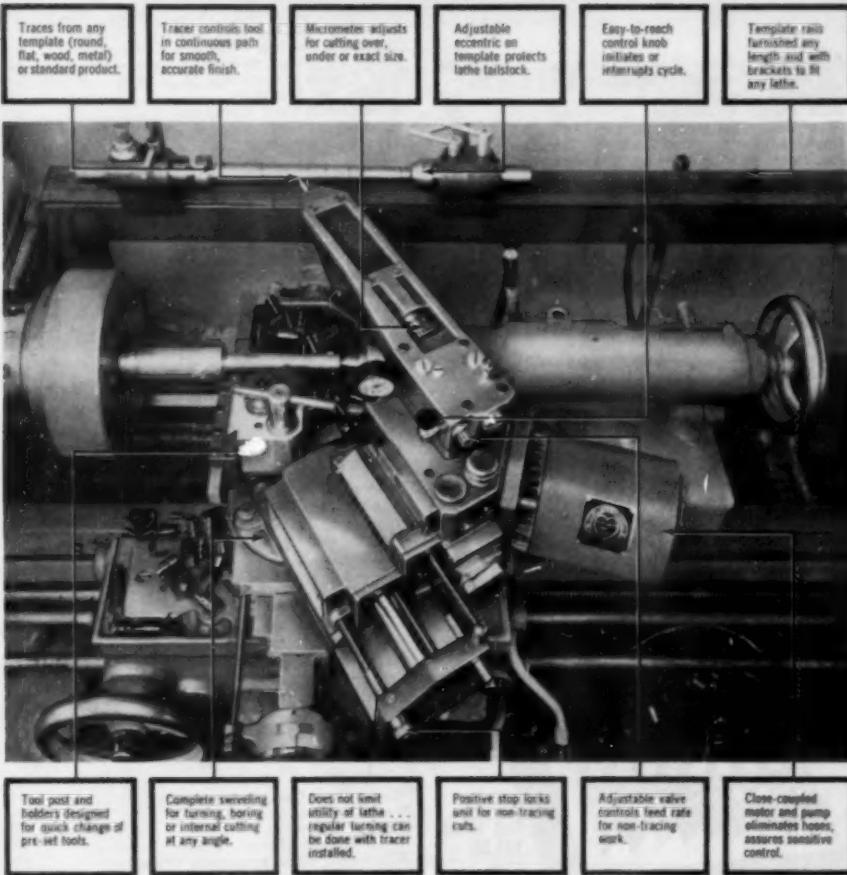
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1	48-56-64-72-86-96	9/16	28-32-36-40		16-18-20-24-32	
2	46-52-54-56-64-72-96	5/8	12-14-16-18-20-24-27-28-	1-7/8	5-8-10-12-14-16-	
3	46-44-46-48-56-60-64	3/4	32-36-40-44-48-56-60-64	1-15/16	18-20-24	
4	32-36-40-48-56-60-64	11/16	10-11-12-14-16-18-20-24-	2	5-6-8-10-12-	
5	32-36-40-44-48-56-58-	27-28-32-36-40	10-11-12-14-16-18-20-24-	2-1/16	14-16-18-20	
6	64-86	3/4	10-11-12-14-16-18-20-24-	2-1/8	12-14-16	
7	38-32-36-40-48-56-64	27-28-30-32-36-40	10-12-14-16-18-20-24-27-	2-3/16	8-10-12-14-	
8	72-86	13/16	10-12-14-16-18-20-24-27-	1	16-18-20	
9	30-32-36-40-44-48-56-64	32	32	10-12-14-16-18-20-24-	2-5/16	10-12-14-16-18-
10	28-30-36-40-48-56-60-64	7/8	9-10-12-14-16-18-20-	2-1/2	4-8-10-12-	
12	20-22-24-28-30-32-38-40-	27-28-32-36-40	9-10-12-14-16-18-20-24-	2-1/4	12-14-16-18	
14	56-66	1	8-10-12-14-16-18-20-24-	2-5/8	12-14-16	
15	29-24-28-32-40	27-32-36-40	8-10-12-14-16-18-20-24-	1	18	
1/16	60-66-72	1-1/16	10-12-14-16-18-20-24-27-	2-3/8	10-12-14-16-18	
5/64	72	32	10-12-14-16-18-20-24-	2-1/2	14-16-18	
3/32	38-48	1-1/8	7-8-10-12-14-16-18-20-	2-9/16	12-14	
1/8	32-36-40-44-48	27-28-32-36-40	7-8-10-12-14-16-18-20-24-	2-5/8	8-10-12-	
5/32	32-36-40-44-48	1-3/8	8-10-12-14-16-18-20-24-	2-5/4	14-16-18	
3/16	29-24-28-32-36-40-48	27-32	27-32	2-7/8	12-14-16	
7/32	28-24-28-32-36-40	1-1/4	7-8-10-12-14-16-18-20-	2-7/8	8-10-12-	
1/4	14-16-18-22-24-26-27-28-	24-27-32	24-27-32	3	14-16	
9/32	39-32-36-40-48-56-64	1-5/16	6-8-10-12-14-16-18-20-	3-1/4	4-8-10-	
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11/32	30-32-36-40-48-64	24-27-32	24-27-32	4	14-16	
3/8	29-28-32-40-48	1-7/16	8-10-12-14-16-18-20-24	3-1/4	4-8-10-12-	
13/32	12-13-14-18-20-22-27-28-	1-1/2	6-8-10-12-14-16-18-20-24	1	14-16	
10/32	30-32-38-48-64	1-9/16	12-14-16-18-20-24	3-1/2	8-10-12-	
7/16	16-20-24-32	1-5/8	5/8-6-8-10-12-14-	4	4-8-10-	
5/16	32-36-48	10-18-20-24	10-18-20-24	12-14	12-14	
		1-11/16	8-10-12-14-16-18-20-24	4	8-10-12	

HIGH SPEED LEFT HAND TAPS

SIZE	THREAD	SIZE	THREAD	SIZE	THREAD
0	86	3/8	16-24-32	1-3/8	8-8-10-12-16-18-20-24
1	56-64-72	7/16	14-20-28	1-7/16	8-10-12-14-16-18-20
2	56-64	1/2	12-13-20-28	1-1/2	8-8-10-12-16-18-20
3	56	9/16	12-18-20-24	1-9/16	8-10-12-16-18-20
4	32-36-40-48	5/8	11-12-18-28-24	1-5/8	8-10-12-14-16-18-20
5	40-44	11/16	11-16-24	1-11/16	8-10-12-14-16-18-20
6	32-36-40	3/4	10-18-18-20	1-3/4	8-10-12-14-16-18-20
8	32-36-40	13/16	16	1-15/16	8-10-12-14-16-18-20
10	24-28-32-36-40	7/8	8-12-14-16-18-20	1-7/8	8-10-12-14-16-18-20
12	24-28-32	1	8-12-14-16-18-20	1-15/16	8-10-12-14-16-18-20
1/4	29-28-32	1-1/8	7/12	2	4-8-10-12
5/16	18-24-28-32	1-1/4	7-12-16-18		

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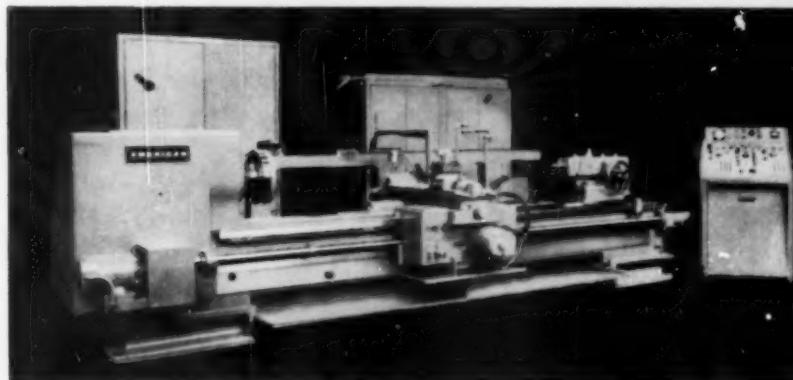
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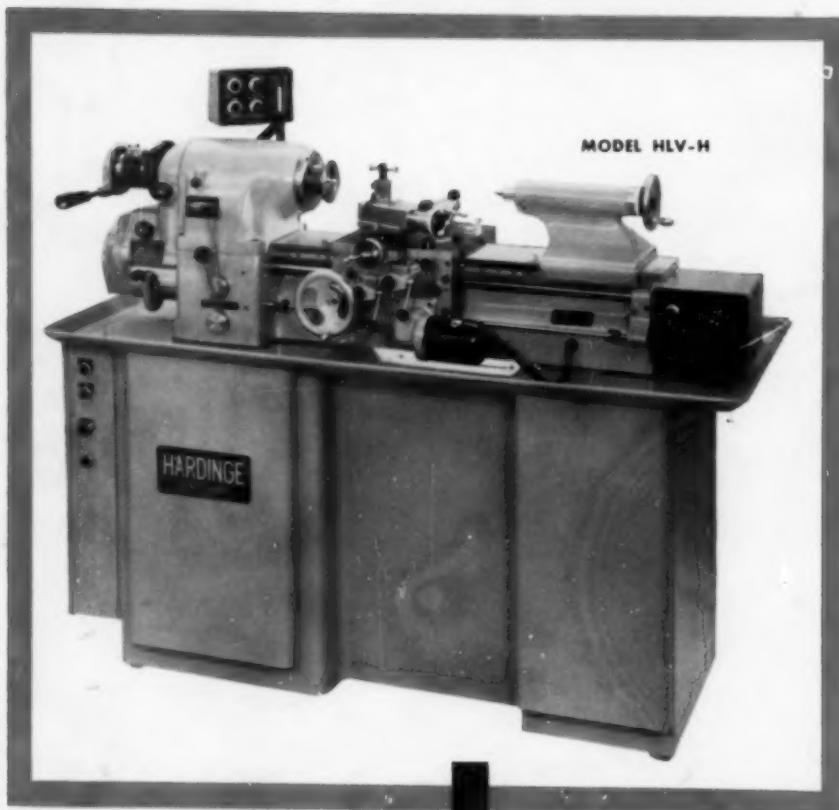
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